BARBADOS

ANNUAL REPORT

OF THE

DEPARTMENT OF SCIENCE AND AGRICULTURE

FOR THE YEAR

1952—1953

ADVOCATE CO., LTD.—PRINTERS

BARBADOS ENTOMOLOGICAL INSTITUTE
18 SEP 1956

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DEPARTMENT OF SCIENCE AND AGRICULTURE

STAFF

Director of Agriculture	C. C. Skeete, O.B.E., B.A. (Cantab).
Deputy Director of Agriculture	W. V. Rose, B.A. (Hons.), (Cantab).
Entomologist	R. W. E. Tucker, M.A. (Cantab), B.Ed. (Capetown).
Veterinary Officer	M. B. Proverbs, M.R.C.V.S.
Assistant Veterinary Officer	P. G. Scoggins, M.R.C.V.S.
Chemist	Vacant
Government Analyst	N. Carmichael, B.Sc., (McGill) M.Sc. (Western) A.R.I.C., (London).
Cultivation Officer	Vacant
Irrigation Officer	A. D. Herbert, D.I.C.T.A.
Co-operative Officer	C. A. E. Beckles, D.I.C.T.A.
Fishery Officer	D. W. Wiles
Assistant Livestock Officer	A. G. F. Seale.
Plant Diseases Inspector	D. R. D. Wiles, D.I.C.T.A.
Office Superintendent	H. O. Ramsey.
Senior Clerk	G. D. Ramsey.
do. do.	A. S. Inniss.
Clerk	C. B. Long.
Clerk	J. K. Drayton.
Clerk	F. B. Taylor.
Clerk	E. F. Oxley.
Clerk	W. W. Ifill.
Clerk	J. A. Miller.
Clerk	E. McD. Russell.

Clerk (Temporary)	G. McC. Farrell.
Stenographer-Typist	Miss N. E. Callender.
do. do.	Miss E. V. Beckles.
Principal Agricultural Assistant	C. B. Foster.
Senior Agricultural Assistant	H. E. Ward.
Assistant to the Analyst	E. W. Maxwell (Ag.)
Agricultural Assistant	L. H. Atkinson.
do. do.	J. E. Clarke.
do. do.	T. O. Hoyte.
Farm Manager, Central Livestock Station, Pine Plantation	H. E. Kirton.
Farm Overseer, Central Livestock Station	A. C. Holder.
Farm Overseer, Pine Plantation	M. E. Murrell.
Senior Peasant Agricultural Instructor	C. A. E. Beckles, D.I.C.T.A. (Ag.)
Peasant Agricultural Instructor	G. B. Pilgrim.
do. do. do.	L. T. Talma.
do. do. do.	G. A. Ramsay.
do. do. do.	C. D. Spooner.
do. do. do.	E. S. Brathwaite.
do. do. do.	F. M. Cummins.
do. do. do.	V. F. Gay.
do. do. do.	A. Yard.
do. do. do.	E. G. St. John.
do. do. do.	H. DaC. Sealy.
do. do. do.	C. V. Drayton.
do. do. do.	C. A. Riley.
do. do. do.	A. J. Bellamy.

Peasant Agricultural Instructor	J. E. WASON.
do. do. do.	D. A. CORBIN.
do. do. do.	E. L. MURRAY.
Senior Analytical Assistant	H. A. JONES.
Analytical Assistant	R. E. BARROW.
do. do.	K. H. STREAT.
do. do.	D. A. WICKHAM.
Entomological Assistant	W. HEADLEY.
do. do.	V. E. JAMES.
do. do.	F. C. GREENE.
Government Laboratory Attendant	H. A. WHARTON.
Entomological Laboratory Attendant	A. GITTENS.
Overseer—Codrington Station	F. A. PERKINS.
Field Superintendent	F. A. JORDAN.
Agricultural Department Messenger	G. BARKER.
Government Laboratory Messenger	L. H. MOORE.

COLONIAL DEVELOPMENT & WELFARE SCHEMES

Scheme D.217—Agricultural Development.

Secretary, Barbados Dairy and Stock Breeders' Association	C. O'NEAL.

Mr. C. C. Skeete, O.B.E., B.A., Director of Agriculture, was granted five days' duty leave from 5th to the 9th of October, 1952, to attend a meeting of the Governing Body of the Eastern Caribbean Farm Institute.

Mr. W. V. Rose, B.A., Agricultural Officer, Nyasaland, was appointed to the vacant post of Deputy Director of Agriculture with effect from the 20th February, 1953. He arrived in the colony on the 30th March, 1953, and assumed duty on the same date.

Dr. P. G. Scoggins, M.R.C.V.S., who had been in practice as a Veterinary Surgeon in Wales from August 1950, arrived in the colony on the 24th July, 1952, to take up the appointment of Assistant Veterinary Officer.

Mr. J. B. D. Robinson, B.Sc., A.R.I.C., Chemist, accepted an appointment as Agricultural Chemist, Kenya. He left the colony on 15th October, 1952, for the United Kingdom on one hundred and eighty days' vacation leave before proceeding to Kenya.

Mr. W. H. C. Knowles, A.I.C.T.A., Cultivation Officer, tendered his resignation with effect from the 5th April, 1953, in order to take up an appointment with the Ozama Sugar Co., in the Dominican Republic.

Mr. A. D. Herbert, Irrigation Officer, was granted two weeks' casual leave from 5th June, 1952, which he spent in Canada.

Mr. D. W. Wiles, Fishery Officer, was granted duty leave from November 13 to 24, 1952, to attend the Fifth Annual Session of the Gulf and Caribbean Fisheries Institute, 1952, at Miami Beach. Approval was also given for him to take advantage of the opportunity, whilst passing through Puerto Rico on his journey, to visit the San Cold Corporation in order to gain an insight into the operation of a large scale quick freeze and cold storage unit for fish.

Mr. L. A. Hall, Senior Analytical Assistant was appointed to the newly created post of Assistant to the Analyst from the 1st of April, 1952, and Personnel Officer, Department of Highways and Transport, from the 19th January, 1953, the date on which he was seconded to that post.

Consequent on the transfer of Mr. L. A. Hall, Mr. E. W. Maxwell, Analytical Assistant, was appointed to act as Assistant to the Analyst from the 19th January, 1953, and Mr. K. L. Deane as Analytical Assistant. The post of Senior Analytical Assistant, held by Mr. L. A. Hall, was abolished.

Mr. G. McC. Farrell, Temporary Clerk, Harbour and Shipping Master's Department, was transferred to the Department of Agriculture from the 1st January, 1953, in place of Mr. K. A. Hutchinson, Temporary Clerk, who was appointed to Harbour and Shipping Master's Department.

BRITISH WEST INDIES CENTRAL SUGAR CANE BREEDING STATION

ADVISORY COMMITTEE

Chairman— C. C. Skeete, O.B.E., B.A., Director of Agriculture, Barbados.

Members — Professor C. Y. Shepherd, C.B.E., Acting Principal of the Imperial College of Tropical Agriculture, Trinidad.

— C. H. B. Williams, M.A., A.I.C.T.A., Director of Agriculture, Trinidad.

— R. F. Innes, B.Sc., Director of Research, Sugar Manufacturers' Association (of Jamaica) Ltd., (Nominee of the Director of Agriculture, Jamaica).

— H. H. Croucher, B.Sc., A.I.C.T.A., Director of Agriculture, British Guiana.

— E. R. H. Martin, D.I.C.T.A., Acting Agricultural Superintendent, Antigua.

— Sir John Saint, Kt., C.M.G., O.B.E., Director, Sugar Technology Laboratory, Barbados.

— M. A. G. Hanschell, B.A., Dip. Rural Econ., Director of Agriculture, Grenada.

STAFF

Cytogeneticist	G. C. Stevenson, B.A., A.I.C.T.A.
Botanist	B. deL. Inniss, B.Sc., A.I.C.T.A.
Agricultural Assistant	N. L. Foster.
„ „	C. D. Gilkes.
„ „	A. N. C. Hewitt.
Statistical Clerk	E. L. Jones.
Stenographer-Typist	Miss S. O. Maxwell.

BOARD OF AGRICULTURE

The members of the Board of Agriculture appointed for the Legislative Session 1952—53 were as follows:—

The Hon. G. D. L. Pile, O.B.E., M.L.C., Chairman.
The Hon. J. A. Mahon, M.L.C.
Sir John Saint, Kt., C.M.G., O.B.E.
F. L. Walcott, Esq., M.C.P.
E. St.A. Holder, Esq., M.C.P.
J. A. Haynes, Esq., B.A., M.C.P.
L. E. Smith, Esq., M.C.P.
C. O. Armstrong, Esq.

The Director of Agriculture is *ex-officio* member of the Board.

REPORT ON THE WORK OF THE DEPARTMENT OF SCIENCE AND AGRICULTURE FOR THE YEAR ENDING 31ST MARCH 1953

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PART I.

SUMMARY OF AGRICULTURAL POLICY

1. The conservation of soil and the maintenance and improvement of soil fertility.

2. The control of pests and diseases of crops.

3. The improvement of crop yields by selection and breeding.

4. The maintenance of a sound animal husbandry industry as an integral part of the farming system.

5. The development and improvement of the Fishing Industry.

6. The encouragement of the production of local food crops, especially green vegetables.

7. The stimulation of co-operative ventures, particularly amongst smallholders.

8. The development of irrigation in suitable areas.

PART II.

GENERAL

I. WEATHER CONDITIONS DURING THE YEAR

Detailed climatic data in respect of the current year 1952, as recorded at the Meteorological Station at Codrington, St. Michael, are given in Appendix I to this Report. Water is the principal factor limiting plant growth in Barbados, and since the water supply is almost entirely dependent on rainfall, the monthly average rainfall for the Colony is an important item to record. The average rainfall for the period December 1950—March 1952, which covers the growing period of the plant cane, compared with the average rainfall for the two previous fifty-year periods, are set out in Table I.

TABLE I.

MONTH	Rainfall in Inches		
	Average		Average 1950-52
	1850-52 to 1899-01	1900-02 to 1949-51	
December	4.96	4.56	4.68
January	3.69	3.09	3.45
February	2.29	1.87	14.35
March	1.99	1.88	2.28
April	2.45	2.10	7.50
May	3.67	2.67	2.07
June	5.49	5.29	7.39
July	6.01	6.43	6.03
August	7.70	7.01	12.89
September	8.02	7.48	10.46
October	8.09	7.48	4.37
November	8.02	7.59	10.80
December	4.89	4.59	8.65
January	3.72	3.10	0.58
February	2.26	2.13	0.63
March	1.97	1.90	2.74
Total	75.22	69.17	98.87

The average monthly rainfall figures for the Island for the sixteen-month period, December 1950 to March 1952, when compared with the average figures for the previous two fifty-year averages, show that the rainfall was again considerably above average in respect of eight months of the period and as regards total quantity. Due in large measure to these satisfactory weather conditions which prevailed, sugar production was the second largest in the history of the Island.

II. AGRICULTURAL CROPS

A. SUGAR CANE

(a) Production

The yield of sugar cane reaped during 1952 was the equivalent of 167,875 tons sugar. This was made up of 156,216 tons Vacuum pan sugars,

525 tons Muscovado sugar, 3,674,118 wine gallons Fancy Molasses, which, equated on the basis of 330 wine gallons of Fancy Molasses to the ton of sugar, is the equivalent of 11,134 tons sugar.

The sugar production in Barbados for the past six years is set out in Table II.

TABLE II

Sugar Production for the Period 1947-1952.

	1947	1948	1949	1950	1951	1952
Vacuum Pan Sugar ..	86,369	56,496	133,868	141,706	163,313	156,216
Muscovado Sugar ..	1,655	1,262	1,991	1,276	1,253	525
Fancy Molasses	23,208	20,468	16,872	15,201	23,077	11,134
	111,232	78,226	152,731	158,183	187,643	167,875

(b) Export of Sugar and Local Consumption

The Colony's entire exportable surplus of sugar was purchased by the Ministry of Food. The export of sugar is still regulated by the Sugar Production and Export Control Board of which the Director of Agriculture is Chairman. Care is exercised to ensure that the requirements of the local market are provided for.

The position with regard to local consumption and export during the period September 1951 to August 1952 is as follows:—

	Tons	Tons
Estimated stocks in hand at 1st September, 1951:—		
Fancy molasses for export	14,587	
Sugar for export	24,744	
Sugar in wholesalers' hands	5,880	45,211
Production during 1952		167,875
		213,086
Estimated stocks in hand at 1st September, 1952:—		
Fancy molasses for export	9,612	
Sugar for export	14,401	
Sugar in wholesalers' hands	7,277	31,290
		181,796
Total exports as per Customs returns, for the period:—		
Fancy molasses	16,411	
Sugar	141,614	158,052
Difference representing Sugar delivered —		
(i) to merchants for local consumption; and		
(ii) to vessels for export but not yet cleared by the Customs Department		23,771

By the end of December 1952 most of the sugar for export had been exported.

(c) Fancy Molasses

The Barbados Fancy Molasses industry continues to be under the control of the Fancy Molasses Control and Marketing Board of which the Director of Agriculture is Chairman.

At the end of December, 1951, some 5,144 tons equivalent to 1,697,500 wine gallons of the 1951 Fancy Molasses crop remained to be shipped. The Fancy Molasses Control and Marketing Board allocated some 11,134 tons equivalent to 3,674,118 wine gallons for production during 1952 for export. This quantity was all manufactured by the small fancy molasses plants.

The quantity of fancy molasses which the importing markets required out of the 1953 crop production was 9,740 tons equivalent to 3,214,200 wine gallons. This figure is well above that of recent years.

(d) The Special Funds for the Benefit of the Sugar Industry and the Welfare of the Workers.

As was done since the 1947 crop sugars purchased by the Ministry of Food, a sum of £2. 15s. per ton was included in the price for 1952 crop sugars. During this year as in the previous year, the Domestic Sugar Agreement provided for the collection of an additional levy of $1.80 (7s. 6d.) and the total sum of $15.00 (£3. 2s. 6d.) has been paid into the following funds at the rates shown:—

Sugar Industry Rehabilitation Reserve Fund 20/- per ton.

Sugar Industry Price Stabilization Reserve Fund 20/- per ton.

Labour Welfare Fund 22/6 per ton.

The Sugar Industry Rehabilitation Reserve Fund continues to be administered by the Sugar Industry Capital Rehabilitation Reserve Board, of which the Director of Agriculture is Chairman. The major portion of the funds collected has been paid out in accordance with Regulations made under the principal Act.

The Sugar Industry Price Stabilization Reserve Fund is administered by the Sugar Industry Price Stabilization Reserve Board of which the Director of Agriculture is Chairman. The amounts accruing to this fund have been deposited with local banks and are earning interest. The purpose of this fund is to mitigate the adverse effect of a reduction in the price of sugar.

The Labour Welfare Fund is administered by the Governor-in-Executive Committee.

The Sugar Industry (Rehabilitation, Price Stabilization and Labour Welfare) (Local Consumption) Act, 1952, was enacted to provide that so much of the levy as is imposed on sugar manufactured in 1952 which is sold for consumption in the Island, shall be paid to the Governor-in-Executive Committee, instead of to the above funds, for the purpose of stabilising the price of certain classes of sugar only, if the Governor-in-Executive Committee thinks this expedient.

(e) Acreage under Cane.

Under the Sugar Cane Census Act, 1937-31, it is compulsory for all landholders with more than ten acres of land to make a return to the Depart-

ment of Agriculture showing the acres of cane, and the various varieties to be reaped during the ensuing crop season.

The results of the census for the 1953 crop are presented in Table III together with the corresponding figures for the years 1944 to 1952 inclusive.

As a result of the recent surveys the acreage of cane grown by smallholders is estimated at 10,000 acres.

TABLE III.

Acreage of Sugar Cane reaped in the years 1944–53

Year	ACREAGES								
	Plantations							Small Holders (estimated)	Total
	Plant Canes	First Ratoons	Second Ratoons	Third Ratoons	Fourth Ratoons	Fifth Ratoons	Sixth, Seventh, Eighth & Tenth Ratoons		
1944 ..	14,144.22	10,557.28	4,203.08	814.51	72.82	4.50	—	7,000	36,796.41
1945 ..	14,551.53	9,744.58	4,756.20	865.70	52.02	1.34	—	7,000	36,971.37
1946 ..	14,056.25	11,614.50	5,578.25	1,817.50	51.25	6.00	—	7,000	40,123.75
1947 ..	13,365.25	11,569.00	6,501.00	1,771.50	257.25	2.25	—	7,000	40,466.25
1948 ..	13,480.57	10,614.00	6,281.00	2,126.75	255.50	28.00	—	7,000	39,786.00
1949 ..	13,869.56	10,911.46	5,249.99	2,090.72	370.49	33.00	—	7,000	39,705.22
1950 ..	13,435.78	11,785.71	6,350.76	2,147.50	415.25	53.00	17.25	7,000	41,241.25
1951 ..	12,555.14	11,833.17	7,137.28	2,869.35	558.28	52.00	15.50	8,000	43,020.72
1952 ..	11,531.99	11,519.78	8,344.59	3,813.25	946.27	59.75	24.00	8,500	44,739.63
1953 ..	10,454.10	10,880.16	8,680.89	4,593.29	1,220.26	131.25	22.50	10,000	45,982.45

(f) Variety Acreages

These were obtained from plantation returns of the variety acreages to be reaped each year. The variety percentages for all crops for the years 1944 to 1953 are presented in Table IV.

TABLE IV.

Percentages of Acreages of Sugar Cane Varieties recommended by the Department and other varieties reaped during the period 1944-53.

Percentages of Totals

Varieties	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953
B.2935	4.73	1.94	0.68	0.26	0.23	0.09	0.04	—	—	—
B.H.10(12) ..	8.00	4.76	3.19	2.49	1.36	0.33	0.09	—	—	—
B.726	4.79	2.95	2.02	1.26	0.70	0.15	0.03	—	—	—
Mixed & other varieties ..	8.50	4.83	2.55	1.25	0.52	0.39	0.47	2.08	1.16	1.78
B.3439	9.49	4.89	2.40	0.54	0.25	0.12	0.06	—	—	—
B.37161	48.69	62.65	74.52	83.83	90.00	92.76	90.80	84.76	80.00	76.04
B.35187	11.28	10.19	6.09	3.25	1.91	0.98	0.53	—	—	
B.34104	4.19	7.46	6.89	3.83	1.24	0.32	0.12	—	—	
B.4098	0.33	0.33	1.56	3.00	3.43	4.14	4.93	5.82	6.87	7.39
B.41227	—	—	0.06	0.08	0.06	0.14	0.49	0.76	0.89	1.01
B.41211	—	—	0.04	0.21	0.30	0.58	2.44	6.58	9.74	12.54
B.43391	—	—	—		—	—	—	0.73	1.28	1.24

It will be seen from the above Table that of the total acreage reaped by plantations in 1953, B.37161 occupied 76.04 per cent., a decrease of 4.02 per cent. as compared with 1952. The acreage of B.41211 increased by 2.80 per cent., that of B.4098 and B.41227 by 0.52 per cent., and 0.12 per cent. respectively The acreage under B.43391 decreased by 0.04 per cent.

PART III.

SECTION I.

PEASANT AGRICULTURE

BY

C. A. E. BECKLES,
Ag. Senior Peasant Agricultural Instructor

A. General Conditions during the Year.

The Weather. Although rainfall distribution over the period was not ideal for the peasant, 1952-53 proved to be another year of comparatively good weather conditions. After a rather severe dry season some good showers occurred during the months of September to November.

The Main Food Crops. The exceptionally dry weather during the first few months of 1952 had three important effects on the food crop situation during the year. First, planting was delayed because hand cultivation on which many peasants had to depend could not be carried out until after the first few showers. Secondly, at the end of this dry spell, planting material, especially of sweet potatoes, was difficult to obtain. Thirdly, peasants who were able to obtain the necessary planting material were induced to "throw out" more land to food crops because of the effects of the drought on the ratooning of canes. The net result of these factors was that the main food crops, sweet potatoes, Indian corn, eddoes, cassava and early yams, although adequate by the end of the year, were later than usual.

Sugar Cane. In view of the weather conditions prevailing during the year, the yields of sugar cane on small-holdings, though well below those of estates, were better than expected. In some areas difficulty was experienced in getting the canes cut and transported to the factory. On the whole, however, small cultivators were well satisfied with the results of the crop. In the past the area under peasant canes has been estimated at between 7,000 and 8,500 acres. A survey carried out during the year showed that the acreage of peasants' canes to be reaped in 1953 was approximately 10,000 acres. The following are some yield data for estate and peasant cultivators:—

Sugar Cane Delivered to all Factories in 1953.

Estates (tons)	*Peasants* (tons)	*Total* (tons)	*Peasants' Canes as Percent of Total*
1,172,091	209,630	1,381,721	15.17

Average Number of Tons of Cane per Acre Reaped in 1953

	Area (acres)	*Yield* (tons)	*Average Yield per Acre* (tons)
Estates	35,982	1,172,091	32.58
Peasants	10,000	209,630	20.96

TABLE I.

Summary of Sugar Cane Yield Data, 1946—53

Year	TOTAL CROP (tons)				Average No. of Tons per Acre Reaped	
	Estates	Peasants	Total	Peasants as per cent of total	Estates	Peasants
1946	946,345	158,537	1,104,882	14.00	28.57	22.65
1947	866,662	122,443	989,105	12.38	25.89	17.49
1948	641,044	77,211	718,255	10.75	19.50	11.03
1949	1,122,072	184,524	**1,306,596**	14.12	34.31	26.36
1950	1,118,003	198,903	1,316,906	15.04	32.65	28.41
1951	1,402,671	288,806	1,691,477	17.07	40.05	36.01
1952	1,221,701	285,902	1,507,604	18.96	33.71	33.63
1953	1,172,091	209,630	1,381,721	15.17	32.58	20.96

Minor Crops. These comprise economic crops other than sugar cane and the starchy root crops, generally referred to as ground provisions. They include cotton, groundnuts, fruits and "green" vegetables. Cotton and groundnuts, the former of which is dealt with in another section of this Annual Report, are grown principally in the parishes of St. Philip and St. Lucy. The two main varieties of groundnuts grown are the Virginia Bunch and a runner type known as "local", for which there is a general preference. The area planted to this crop was less than usual, owing to shortage of seed. Germination for the most part was satisfactory and some good yields were harvested. One peasant plot in St. Philip yielded at the rate of 1,200 lb. nuts per acre.

Tree crops, mainly coconuts, mangoes, pears, citrus fruits, bananas, breadfruit and golden apples, on the whole, yielded well in season. As was to be expected, the very dry weather at the beginning of 1952 resulted in heavy shedding of blossoms and young fruit, especially in the case of mangoes, pears and breadfruit.

Except during the usual lean months, August to October, adequate supplies of green vegetables, especially carrots, beets, beans and tomatoes, were readily available. During the early months of 1953 vegetables, particularly beans and tomatoes, were obtainable in large quantities and at exceptionally low prices. Tomatoes were sold in Bridgetown during this period at as low as six cents per pound. A large proportion of these vegetables was grown on a field scale as "catch" crops by peasants as well as estates.

Pests and Diseases. The pink bollworm, after an absence of several years, reappeared in 1951 and did some damage to the 1952-53 cotton crop as well. No other pests of serious importance were reported during the year. Despite the handicap of lack of adequate spraying equipment from which most peasants suffer, generally speaking, they co-operate well with the Peasant Agricultural Instructors in carrying out measures of control.

Peasant Livestock and Animal Husbandry. Following the close of the cane crop in May, when green cane tops were no longer available, livestock keepers experienced considerable difficulty in obtaining adequate supplies of green fodder. This shortage continued until about September. The price of

the indifferent fodder obtainable in Bridgetown at this time rose to 80 cents to $1.00 per 100 pounds. Except for a temporary shortage in June, 1952, concentrated feed was easily obtainable throughout the year. In May, 1952, the price of this balanced animal feed was increased from $9.80 to $10.00 per bag, and dropped to $8.80 per bag in September. In February, 1953, the price was further reduced to $8.35 per bag.

The Peasants' Loan Bank. The steady rise in the number and amount of loans granted by the Peasants' Loan Bank in successive years in the past was maintained in 1952-53. The Bank, therefore, continues to show a satisfactory expansion of its business of meeting the credit needs of peasants. This is illustrated in the following table of comparative figures submitted by the Manager of the Bank:—

TABLE II.

Statement on Loans made during the Year

	1950-51 (Nos.)	1951-52 (Nos.)	1952-53 (Nos.)
Number of loans granted during the financial year 1st June—31st May	582	672	719
Short term loan accounts opened during the previous financial year (for cultivation, manures, taxes) and still outstanding during current financial year	55	149	83
Long term loan accounts opened during the previous financial year (for repayment of Mortgages, Purchase of Livestock and Irrigation) and still outstanding during current financial year ..	255	347	343
	892	1,168	1,145
Less extensions of loans included in (1) above	7	68	15
Total number of accounts on books during the financial year	885	1,100	1,130
Amount of loans advanced	$42,180.00	$56,822.00	$69,341.00

Peasants' Annual Competitions. In addition to the Cotton Plots Competition which is naturally restricted to the cotton growing districts, two island-wide competitions open to peasants were held as usual during the year in connection with the Annual Agricultural and Industrial Exhibition. These were the Peasant Gardens Competition and the Peasant Holdings Competition. Judges were the Plant Diseases Inspector and the Acting Senior Peasant Agricultural Instructor. Preliminary eliminations were carried out by the Peasant Agricultural Instructors. The number and standard of the entries finally submitted for both these competitions were satisfactory.

B. The Work of the Department's Peasant Agricultural Extension Services.

Staff. No staff changes took place during the year. The Co-operative Officer continued to act as Senior Peasant Agricultural Instructor and remained in executive charge of the extension services pending the appointment

of a Deputy Director of Agriculture. The Peasant Agricultural Extension Staff on 31st March, 1953, consisted of an Acting Senior Peasant Agricultural Instructor and 16 Peasant Agricultural Instructors. Six of the latter were in charge of the six District Stations, in addition to being responsible for some district work. The remaining 10 were assigned to purely district work.

Visits to Peasant Holdings. The Peasant Agricultural Instructors paid 11,634 visits to peasant holdings during the year, an increase of 4,630 over the number recorded for 1951-52. The number of visits paid is no criterion of an Instructor's efficiency. This considerable increase, however, does indicate that individual peasants were visited with greater frequency. The Peasant Agricultural Instructors were, therefore, provided with an opportunity of making their work more effective and of greater benefit to the peasants. Thus, the increase in the Peasant Agricultural Extension Staff from 11 in 1949-50 to 17 as at present, with a consequent reduction in the size of each Instructor's district, appears to be fully justified.

School Gardens. The total number of visits paid to school gardens by the Peasant Agricultural Instructors during the year was 241, as compared with 191 the previous year. The general standard of the gardens, in spite of unfavourable weather conditions, especially during the first two terms, was good. It was noticeable, however, that the teachers in charge of some school gardens had become discouraged and had relaxed their efforts owing to such disabilities as absence of suitable enclosures and inadequate water supply.

The Annual School Gardens Competition took place as usual. Adjudicators were the Plant Diseases Inspector and the Acting Senior Peasant Agricultural Instructor who carried out three inspections, one at the end of each of the school terms. The usual high standard was maintained. The first three prize-winning gardens, one of which was that of a girls' school, were outstanding.

Co-operation. The shortage of senior staff, resulting in the Co-operative Officer's continuing in executive charge of extension services, meant that no intensive propaganda campaign could be undertaken for the promotion of co-operative societies. Nevertheless, the Co-operative Officer delivered a number of lectures on various aspects of Co-operation during the year, and attended meetings of Co-operative Societies and other groups at an average rate of about 12 meetings per month. Some assistance was rendered by members of the Peasant Agricultural Extension Staff, but the main burden of this work, which normally had to be carried on at night, fell on the Co-operative Officer.

At the end of March, 1953, the number of societies registered under the Co-operative Societies Act was six. These were as follows:—2 savings, 1 consumers and 3 marketing.

The two savings societies, while building up capital through the practice of thrift, were engaged in the study of co-operative principles and practice with a view to conversion eventually into the type of truly co-operative society most suited to the needs of their respective members.

The consumers society which was registered in August, 1952, started business early in 1953 when it opened a green grocer's shop. It was clear from the outset that the members were too inexperienced in business management and the complexities of handling highly perishable commodities to make the venture a success.

The marketing societies undertook mainly the marketing of members' canes in accordance with the 1951 Domestic Sugar Agreement. As a result of their respective co-operative efforts, these societies earned a total of approximately $600.00 in extra price for their canes.

One of the marketing societies, in addition to marketing of canes, also engaged very successfully in bulk purchase of fertilisers for retail sale to its members. Another was able to purchase its own lorry and undertake the transport of its members' canes to the factory at considerable saving in cost.

In addition to these six registered societies, four other groups were in process of formation. One of the most promising of these was a savings society started among elementary school teachers. Another was a marketing society which proposed operating in the parish of Christ Church.

Co-operators' Day was observed on Saturday, 19th July, 1952. In the absence of a Co-operative Union, individual societies take it in turn to sponsor these celebrations. The society responsible for making arrangements for that year's function was the Shamrock Co-operative Credit Union, which at the time was not yet registered. The guest speaker for the occasion was Mr. D. A. Wiles, Assistant Colonial Secretary, who delivered an inspiring address on the "Value of Co-operation". The celebrations produced a most stimulating effect on the large number of co-operators and others who attended.

The annual audit of accounts of registered societies was carried out by the co-operative section of the Department after the close of the financial year on March 31, 1953. It was decided that no audit fee would be charged co-operative societies during their first year after registration. The following summary, prepared by the co-operative audit clerk who was appointed on a part-time basis from April 1, 1953, gives the position with respect to these societies at the end of March, 1953.

TABLE III.

Statistics on Registered Co-operative Societies as at March 31, 1953

No. of Societies	Member-ship	Share Capital/ Savings	Turnover	Gross Profits	Net Profits	Reserve Funds
6	380	$2,865.73	$40,779.32	$523.88	$151.28	$206.33

Youth Work. Progress in organised agricultural and other rural activities among adolescents continued to be slow. The Department has had to rely mainly on the work that could be done through the medium of the schools. The Leeward Young Farmers' Club continued to function as it had done since 1949. Courses for members of the club were organised during the year in crop and animal husbandry, and the Domestic Science class started by Mrs. G. A. Ramsay in 1951 was continued. A co-operative savings society organised among members of the club was registered on May 9, 1952, and functioned satisfactorily during the year.

Soil Conservation and Cultivation. The number of soil conservation projects carried out on peasant holdings under the supervision of the extension staff in 1952-53 was the same as in the previous year, namely 12. The chief

problem is how to convince peasants generally of the urgent need for contour cultivation as a soil conservation measure. Until that has been solved, peasants will make no serious effort to overcome those factors, including that of obtaining adequate labour, which almost force them into maintaining the traditional system of cane-hole cultivation. Progress with soil conservation should be greatly accelerated when mechanical cultivation of peasant holdings becomes more generally practised.

C. The District Agricultural Stations.

There was no major change during the year in the system of management of the six District Agricultural Stations. Once again irrigation facilities at some stations proved inadequate, and resulted in complicating the work of the peasant investigational units. The well at "Jerusalem", St. Peter, had to be abandoned in July, 1952, owing to the collapse of the walls of the 80-ft. tunnel leading into it from an underground stream. Water for irrigating field crops was, as a result, unavailable at this station for the rest of the year.

The Stud Centres. The introduction of artificial insemination on the Stations towards the end of the year made it possible gradually to reduce the number of bulls in the Stations' establishment. As might be expected, livestock keepers generally did not readily accept the new technique, although in some districts there was a surprisingly large number who were quick to appreciate and avail themselves of the advantages of artificial insemination over natural service. The total number of stud services of all kinds at the stations for the year, including artificial inseminations but not including free returns, was 4,785, or 268 more than in 1951-52. There was no alteration in the service fees charged which were as follows:—bulls (including artificial inseminations) 72 cents, boars 48 cents and bucks and rams 18 cents.

TABLE IV.

Number of Sires standing at Stud Centres at 31st March, 1953

Station	Bulls	Buck Goats	Ram Sheep	Boars	Total
The Home	2	2	—	2	6
Sayes Court	1	2	1	2	6
Groves	2	3	3	3	11
Jerusalem	2	3	1	2	8
Haggatts	1	1	2	1	5
Bullen	1	2	1	1	5
Total	9	13	8	11	41

The stud animals comprised the same breeds as in the previous year, namely:— Grade Guernsey and Holstein bulls, British Alpine and Saanen buck goats, Black Belly and Wiltshire Horn ram sheep and Berkshire and Large Black boars.

TABLE V.

Number of Services paid for during the Year ending 31st March, 1953.

Station	Bulls	Buck Goats	Ram Sheep	Boars	Total
The Home	362	173	10	234	779
Sayes Court	173	162	77	198	610
Groves	528	411	386	280	1,605
Jerusalem	344	340	92	106	882
Haggatts	83	198	80	30	391
Bullen	144	179	73	122	518
Total	1,634	1,463	718	970	4,785

The Financial Returns of the Stud Services. A large proportion of the expenditure on stud animals is incurred in maintaining bulls. The reduction in the number of bulls kept, consequent on the introduction of artificial insemination on the Stations, did not begin until the end of 1952-53 and should, therefore, be reflected in a drop in expenditure in 1953-54. As it was, there was a slight increase in the cost of maintaining the stud centres, as compared with the previous year, owing mainly to increased labour costs. Revenue remained much the same. A summary of the cash and non-cash expenditure and revenue in connection with the stud animals on the six District Stations is given in the Table below:—

TABLE VI.

Statement of Revenue and Expenditure on Stud Animals for 1952—53

Items	The Home	Sayes Court	Groves	Jerusalem	Haggatts	Bullen	Total
	$	$	$	$	$	$	$
Expenditure ..	2,697.63	1,281.14	3,833.39	2,651.56	2,976.14	1,621.06	15,060.92
Revenue ..	507.12	336.79	826.68	403.32	176.20	188.48	2,438.59
Difference	2,190.51	944.35	3,006.71	2,248.24	2,799.94	1,432.58	12,622.33

Breeding Sows. The big demand for young pigs produced on the Stations continued. During the year it was decided that instead of selling weaners at 8 or 9 weeks of age, these young pigs should be kept on the Stations up to 12 to 14 weeks, that is, well past the critical period, before being sold. The increased cost of the bigger animal proved no deterrent to prospective buyers, most of whom seemed to prefer the sturdier pig.

The Demonstration Side of the District Stations. Work in this connection is concerned principally with demonstrating an efficient mixed farming system. The crops grown under this system include the main cash crop, sugar cane, heavy food crops, such as, yams and potatoes, vegetables, bananas and fodder. At two of the Stations, namely, Sayes Court and The Home, at which milk can be produced and sold economically, small dairy units were maintained. At other Stations cows were kept mainly for the purpose of producing milk for rearing calves.

Financial Returns of the Demonstration Side of the Stations. The non-cash items accounted for in the statement below include, as usual, fodder and feeding stuffs, such as, yams, sweet potatoes and cane tops grown on the Stations and fed to the livestock, and pen manure produced on the Stations and applied to the crops. Some increase on the 1951-52 figures is shown for both expenditure and revenue. The increase in expenditure was due almost entirely to increased labour costs. Expenditure and revenue for the six Stations together are shown in summary as follows:—

	Cash	*Non-Cash*	*Total*
	$	$	$
Expenditure	24,820.40	4,586.64	29,407.04
Revenue	16,414.50	7,505.99	23,920.49

Financial Statement for the Stations as a Whole. Non-cash items of expenditure and revenue in the final analysis practically balance each other and are, therefore, left out of account in the statement given below. In addition to the items of expenditure and revenue included above on the demonstration side, this cash statement comprises items in connection with experimental or investigational work, subsidized activities, such as, the stud establishment and pig breeding, and expenditure of a capital nature.

Statement of Cash Revenue and Expenditure for the Year 1st July, 1952 to 30th June, 1953

Expenditure	*1951-52*	*1952-53*
Total expenses for the six Stations ..	$47,336.90	$54,803.23
Revenue :		
Actual receipts brought to account for the six Stations	$22,723.59	$22,657.18

Increased labour costs again was the main cause of the appreciable rise in expenditure over that for 1951-52. Heavy capital expenditure was also incurred in connection with irrigation at some of the Stations. Revenue remained more or less stable, as no attempt was made to offset increases in expenditure by raising prices for goods and services provided by the Stations.

SECTION II

SUGAR CANE BREEDING AND SEEDLING TESTING

By

B. deL. Inniss

Botanist, B.W.I. Central Sugar Cane Breeding Station.

Sugar Cane Breeding—B. 54′ and B. 55′ Series.

Sugar cane breeding work was carried out at Groves Agricultural Station from October 1952 to January 1953. Arrowing was poor on the whole and rather late. One hundred and ten crosses were made, as well as seven selfs and sibcrosses for the Cytogeneticist. It is estimated that over 67,000 seedlings germinated, 38,323 were potted, 33,414 survived and 27,323 were planted in the Field Nursery and the B.54' Series Short Season First Year Seedling Trial.

Details of the crosses made, and seedlings raised, potted and planted out are available in the Annual Report of the B.W.I. Central Sugar Cane Breeding Station.

Reaping of the First Year Seedling Trials—B. 53′ Series.

Four hundred and four seedlings were selected from the First Year Seedling Trials of the above series, details of which are tabulated in the abovementioned Annual Report. These seedlings have been established in multiplication plots at Codrington, and will be planted in Second Year Seedling Trials in October 1953.

Seedlings of the B. 52′ Series.

The seedlings of this series were planted in Second Year Seedling Trials in November 1952 at the low rainfall station, Codrington (two trials) and in duplicate trials at the high rainfall stations, Clifton Hall and Fisherpond. In addition, the short season selections were also planted in a Short Season Second Year Seedling Trial under irrigation at Codrington in June 1953.

Seedlings of the B. 51′ Series.

The seedlings of this series were cut as plant canes in the Second Year Seedling Trials at the low rainfall station, Codrington (2 trials) and in duplicate trials at the high rainfall stations, Hothersal and Todds. Thirty-three selections were made, two of which are for the breeding plots at Groves only. The most promising will be tested further in Barbados, and in October 1953, Colonies which contribute to the Station will receive selected consignments. Particulars of the performance of the selected seedlings are given in the Annual Report of the Station.

Seedlings of the B. 50′ Series.

These seedlings were cut as ratoons in the Second Year Seedling Trials in the high rainfall areas at Pool and Andrews during the past crop season. Particulars of their performance are given in the Annual Report of the Station. The most promising seedlings of this series were planted in Third Year Seedling Trials in November 1952.

Seedlings of the B. 49′ Series.

Seedlings of this series were cut as plant cane in Third Year Seedling Trials during the past crop season. Generally speaking, the new variety, B.4744, which was introduced as a standard into these trials for the first time, outyielded all other varieties by large amounts of plant cane. The sucrose content of the juice and purity figures were also satisfactory. B.49257 also gave heavy yields of plant cane, but rotted badly in some trials, and has a very poor sucrose content. B.49311 gave moderately good yields of plant cane of excellent quality, and may become a useful variety if its ratooning is satisfactory.

Seedlings of the B.48′ Series

The seedlings of this series were cut as first ratoons in the Third Year Seedling Trials. None of these outyielded the standard varieties in these trials. The standard variety, B.41227, performed particularly well, giving very heavy yields of ratoon cane of good quality. B.48392 gave quite good yields of ratoon cane, but the juice quality was not good enough for this variety to be considered for commercial purposes.

Seedlings of the B.47′ Series

These were cut as second ratoons in the Third Year Seedling Trials. B.4744 was outstanding in the high rainfall areas, but was no better than the other standard varieties in the low and intermediate rainfall areas. Here, B.4738 and B.4747 were outstanding. Both of these varieties have quite good juices, but B.4747 is fairly thin, and the canes tend to tangle, making them difficult to cut and clean.

B.47258 and B.47380 both have exceptionally good juices, and have given moderately good yields of ratoon cane. B.47380 has been planted in Select Seedling Trials, and B.47258 will be introduced into the next series of these trials to be planted.

Seedlings of the B.45′ and B.46′ Series

Seedlings of these series were cut as third ratoons in one Third Year Seedling Trial at Kendal. B.45151 was outstanding, outyielding the other varieties tried by quite a wide margin. The juice quality of this variety is excellent, and it has been released for trial on a commercial scale. B.46364, unfortunately, had to be cut for planting material and so no ratoon data could be obtained for this variety. It was planted in Select Seedling Trials in November 1953, and appears to perform well in the high rainfall areas only.

Select Seedling Trials

The varieties included in these trials were B.37161, B.41211, B.45151, B.4744 and B. 47419. B.45151 was not included in the trials in the low rainfall areas. In the low rainfall areas there was little to choose between B.37161, B.41211 and B.4744, while B.45151 gave the lowest yields of cane and sugar in both trials. The difference between mean yields in both trials was insignificant. In the intermediate rainfall areas, B.4744 was significantly better than B.37161 on cane and sugar, and on the valley soils it was significantly better than any of the other varieties. In the high rainfall areas, B.4474 outyielded all other varieties tried, but the results were not significant at Bowmanston, while it was significantly better than B.37161 and B.41211 only at Applewhaites. B.45151 performed exceptionally well, particularly in the high rainfall areas and gave an excellent juice. B.47419 was poor in the low rainfall areas ,but fairly good in the high rainfall areas for which it was recommended.

Details of the trials are available in the Annual Report of the B.W.I. Central Sugar Cane Breeding Station.

SECTION III.

BOTANY

Ornamental plants were propagated and distributed as usual. The number of plants distributed is given in Table I.

TABLE I.

Year	Number of plants distributed
1951-52	5,732
1952-53	5,528

Distribution of Vegetable Seeds from the Department's Office

This distribution aims at encouraging the purchase of vegetable varieties which are known to be suited to local conditions. The Department purchases these seeds from reliable firms and sells them in small quantities at cost. The quantities distributed are given in Table II.

TABLE II.

Seed	Variety	Amount — lb.	
		1951-52	1952-53
Beans	Bountiful	13,026	12,779
,,	Kentucky Wonder	115	155
,, Lima	Fordhook	100	95
,, ,,	Ideal	100	91
,, ,,	Early Giant	25	10
,, ,,	Tender Green	5	—
,, ,,	Super Green	5	—
,, ,,	Plentiful	5	—
,, ,,	Henderson Stringless	5	—
,, ,,	Top Crop	25	209½
,, ,,	Green Pod	—	20
,, ,,	Landreth's Stringless	20	—
Beet	Detroit Dark Red	236	194
,,	Early Blood Turnip	70	79¾
,,	Early Egyptian	15	64¾
,,	Lutz Green-leaf	10	10
Cabbage	Hastings Sure Crop	18	9
,,	Danish Ball-head	3½	15
,,	Late Flat Dutch	3½	10
,,	Wakefield Charleston	24	29½
,,	Early Jersey Wakefield	11½	24½
,,	Resistant Golden Acre	11½	24
,,	Succession	7½	9½
Cantaloupe	P.M.R. No. 45	2¾	1¾
Carrot	Chantenay	55	95¼
,,	Danvers	155	214¼
,,	Oxheart	215	300¼
Cauliflower	Sutton's Early Market	2	—
,,	Sutton's Early Patna	8	10½
Cucumber	Marketer	½	—
,,	A. & C.	6	7
,,	Cool and Crisp	6	5½
Egg Plant	Black Beauty	1½	2
Khol Rabi	Extra Early White Vienna	3½	4
Lettuce	Mignonette	68	83
,,	Black Seeded Simpson	5	—
,,	Bibb	5½	11
,,	Grand Rapids	½	—

TABLE II — (*Concluded*)

Seed	Variety	Amount — lb	
		1951—52	1952—53
Okra	Early Prolific	2½	—
„	Dwarf Prolific	8	23
Onion	Crystal White Wax ..	½	—
„	Southport Red Globe ..	3	4¾
„	Red Bermuda	3½	2¼
Parsley	Emerald	16	20¼
Pea	Laxton's Progress	38	—
Pepper	Ruby King	1½	1⅛
„	Early Wonder	¾	1¼
Radish	Scarlet Globe	15	13
Squash	White Bush-Scalloped ..	10½	10¼
„	Early Prolific Straightneck	¼	—
Swiss Chard ..	Lucullus	3	3¼
Tomato ..	Bounty	25	25
„	Marglobe	57	36½
„	Pritchard	25	—
„	Bonny Best	35	25
Turnip	Purple Top White Globe ..	3¼	3¼
		14,623	14,732½

(a) *Citrus.* Eight types of citrus trees, comprising lime, orange, grapefruit, shaddock, lemon, mandarin, pomelo and citron, were again propagated and distributed. The method of propagation employed during the year consisted of budding the citrus on seville orange seedlings propagated from locally procured seed. Eight varieties of oranges were also budded. Two of these, viz., Claybury and Banfield, are of local origin and the following six from Trinidad: Navel, Ruby, Pineapple, King, Parson Brown and Valencia. Five varieties of grapefruit were distributed. Of these, Foster's Pink, Marsh and Walters are from Trinidad, and Claybury Nos. 1 and 2 are local varieties.

During the year 1952, fifteen hundred and forty-five budded citrus plants were distributed at a price of six cents each to peasants and twenty-five cents each to others. From the 1st of January 1953, however, these prices were increased to twelve cents each to peasants and two shillings each to others. The price of ornamental plants was also increased from eighteen to thirty cents a seedling.

(b) *Dwarf Coconuts.* Four thousand, nine hundred and fifty-seven dwarf coconuts were imported from St. Lucia and sold for planting purposes. This represents an increase of three thousand, six hundred and three on the number sold for the previous year.

TABLE III.

Species	Varieties	Total Number of plants delivered	
		1951-52	1952-53
Citrus			
Citron ..	Trinidad	6	19
Grapefruit ..	Foster, Duncan, Marsh, Walters, Claybury Nos. 1 & 2	68	283
Lemon ..	Claybury, Frere Pilgrim ..	21	44
Lime ..	Dover, Claybury, Lisbon ..	213	580
Madarin ..	Dancy, Claybury, Nos. 1, 2 & 3	40	70
Orange ..	Tardiff, Parson Brown, Navel, Ruby, Pineapple, Claybury, Nos. 1, 2 & 3, Bernardo, King, Valencia	196	462
Shaddock ..	Kinch, Claybury Nos. 1 & 2	40	51
Pomelo ..	Codrington	41	36
		625	1,545
Avocado Pear ..	Selected seedlings	116	272
Miscellaneous			
Breadfruit ..		40	63
Breadnut ..		4	2
B'dos Cherry		36	25
Fig		15	6
Guava ..		49	91
Grape ..		13	17
Golden Apple		12	37
Genip		1	—
Mango (Stock)		—	47
Pawpaw ..		36	21
Sugar Apple ..		6	22
Soursop ..		4	15
Water Lemon ..		6	3
Dwarf Coconuts	Hatched Nuts	1,354	4,957
		2,317	7,123

Afforestation

Distribution of Trees. Fifteen thousand, eight hundred and thirty-five casuarina trees were distributed.

SECTION IV.

IRRIGATION

By

A. D. HERBERT,
Irrigation Officer

1. Small Holdings

During the year under review, the operation of the Peasant Irrigation Assistance Fund was continued. The cost of irrigation equipment, labour for installation and well digging continued to rise. Many applicants for irrigation units found themselves financially unable to meet the cost of the units, despite the availability of free grants up to $720.00.

The Irrigation Officer paid 41 visits to peasant holdings in connection with irrigation. Advice and assistance were given whenever necessary.

2. Plantations

Four plantations started irrigation on a limited scale. The Irrigation Officer paid ten visits to these places in an advisory capacity.

3. Agricultural Stations

Irrigation was continued on the six agricultural stations. Efforts were made to improve and make the utmost use of available equipment.

Arrangements were made for periodic inspection of pumping equipment by trained mechanics. In this way, three units have been repaired when necessary and kept in good working condition.

Codrington:

The new submersible pump was formally taken over from the engineers in April 1952. It has given trouble-free service throughout the year.

The irrigation lines, oscillators and booster pumps were kept in repair.

A mobile irrigation system was installed in the orchard and citrus nursery.

Plans and estimates were prepared for the extension of irrigation to additional fields at Codrington.

Central Livestock Station:

Fodder production again had first claim on the available irrigation. Fields of Guinea corn were planted and established under irrigation, and permanent fodder grass was watered regularly.

A limited area of sugar cane received irrigation which resulted in an increase of 10 to 15 tons per acre.

The use of liquid manure on a permanent fodder grass field has resulted in considerably increased yields from the area treated.

Repairs were effected to the electric motor of the booster pump. A new water-proof electric motor was installed in the well. Normal repairs and maintenance were carried out.

A water storage and distribution system has been installed at the Central Livestock Station. This system is supplied with water by the irrigation pumps. A saving on water costs is thus effected.

The Home:

A diesel driven generating plant and submersible pump has been ordered to replace the existing pump. The new equipment will pump 6,000 G.P.H., and is expected shortly.

Repairs were made to the pump and irrigation lines. New rainers were installed.

Sayes Court:

Pipe was transferred to this station from Jerusalem, to facilitate irrigation.

The electric motor and pump became corroded due to the relatively high salinity of the water. Necessary repairs were made.

Bullen:

The electric submersible pump, originally installed at Jerusalem, was transferred to this station. It was necessary for the well to be deepened. Considerable difficulty was experienced in obtaining an adequate flow of water. Electric mains were laid to the well from Paynes Bay.

Additional irrigation pipe and rainers have been added to the irrigation system.

Jerusalem:

This station lies over the stream water area. It was only after considerable digging, and consultation with several authorities on the subject, that a moderate supply of water was obtained in 1948. A forty (40′) foot tunnel had been dug from the bottom of a well to intercept a stream. In 1952, the walls of this tunnel fell in, breaking the props. The situation was carefully examined, and it was considered impractical to spend further funds on dangerous work in a well which is unlikely to yield a supply of water adequate for the station's need.

Arrangements were made for the Water Works Department to supply an adequate volume of water from the new Warleigh pumping station. This supply was available and put into use in January 1953.

Additional mobile irrigation pipe and rainers have been sent to the station and are in use. Necessary repairs and alterations were made to existing pipe and fittings.

Haggatts:

Plans for the irrigation of this station are being held in abeyance until the necessary funds are available.

Groves:

Plans for the irrigation of this station await the development of the new Water Works well at Sweet Vale.

Mental Hospital Farm:

The planned irrigation system has not been installed due to lack of funds.

4. Underground Water Control Act, 1951.

The Provisional Water Control Board held its first meeting on 18th May 1952, and has held further meetings during the year. The necessary Regulations and Forms have been prepared and put into use.

In October 1952, the Irrigation Officer was appointed Secretary of the Board.

The Board was unable to function officially during 1952—53, owing to the fact that the Act was not proclaimed until the end of the year.

5. Irrigation Board.

During the year Government appropriated a sum of money for the investigation of irrigation in Barbados, and created the Irrigation Board, with the Director of Agriculture as its Chairman, to administer the fund.

The Irrigation Board held its first meeting on 26th March 1953. The Irrigation Officer attended this and subsequent meetings in an advisory capacity.

Plans have been prepared for the initial irrigation experiments. Estimates are being obtained of the costs of suitable equipment.

6. Investigational.

An irrigation experiment on sugar cane was laid down at the Pine Plantation in November 1952. Four commercial varieties of cane, having different growth characteristics, are being tested. The time of commencement of irrigation is also under test. The effect of increased Nitrogen on irrigated plots is also being investigated.

Investigations of the use of Nylon blocks for determining soil moisture showed that this equipment is likely to be unsuited to local conditions.

SECTION V.

ANALYTICAL & CHEMICAL

BY

N. CARMICHAEL,
Government Analyst.

Over the period April, 1952, to March 31, 1953, a total of 2,124 samples were examined for various Government Departments, Business Firms and Private Individuals. This represents an increase of more than 10 percent on samples examined during the previous financial year.

The number and distribution of samples dealt with annually for the past five (5) years are given in Table I.

TABLE I.

Distribution of Samples over the Period 1948—1953.

	1948	1949	1950	1951-52	1952-53
Police Department ..	205	274	348	408	274
H.M. Customs ..	95	126	105	78	74
Public Works Department	14	15	—	—	—
Agricultural Department	199	491	572	988	1,139
Parochial & Sanitary Dept.	330	331	357	330	475
Agricultural Society ..	40	83	28	25	5
Other Departments ..	53	55	38	14	27
Private Individuals ..	235	220	83	83	130
Total	1,171	1,595	1,531	1,926	2,124

Particulars of samples analysed in the Food & Drugs section of the Laboratory are given in Tables II to V.

TABLE II.

Samples Examined for the Police Department

Sample	No.
Viscera and examination for Poisons	30
Butters and Cooking Oils	23
Milks	115
Tea, Coffee, Cocoa, etc.	16
Feeding Stuffs	11
Rums	35
Miscellaneous	54
Total	274

Remarks :

Five out of the 115 samples of milk examined were found to be adulterated by the addition of added water.

TABLE III.

Sample	No.
Butters and Cooking Oils	3
Tea, Coffee, Cocoa	0
Feeding Stuffs	0
Fertilisers	1
Milks	13
Petroleum	41
Rums, etc.	2
Miscellaneous	14
Total	74

Samples received were for the purposes of classification according to Customs Regulations.

TABLE IV.

Parochial and Sanitary Department

Sample	No.
Milks	469
Food-stuffs	4
Water	1
Miscellaneous	1
Total	475

Remarks :

Of a total of 469 samples of milk examined, twenty (20) showed adulteration by the addition of water. Food-stuffs comprised: Bacon, Ham, smoked Herrings, Cream of Wheat and Cornmeal to test suitability for human consumption.

TABLE V.

Miscellaneous Analyses

Sample	No.
Butters, Margarines, Cooking Oils	8
Fertilisers	15
Feeding Stuffs	16
Milks	8
Waters	13
Rums	8
Petroleums	3
Hydrometers	1
Unclassified	58
Total	130

General Remarks :

The number of samples examined annually continues to rise (Table I), but technical and clerical assistance have not kept pace with this general trend. These handicaps are real and an improvement in conditions is to be hoped for if decent standards of work are to be achieved.

SECTION VI.

ENTOMOLOGY

By

R. W. E. TUCKER,

Entomologist

Entomological work during the period under review centred mainly around the control, by means of soil insecticides, of root borer *Diaprepes abbreviatus* and root mealy bug *Neorhizoecus n.sp.* The control of the small moth borer of sugar cane, *Diatraea saccharalis,* was maintained by large scale liberations of the borer egg parasite *Trichogramma minutum.*

The re-appearance of *Diaprepes abbreviatus* as a major cane pest was foretold in the 1950—51 and previous Annual Reports. The damage caused by this pest is now very obvious in some areas of the Island, but it is hoped that a proved, economic and safe remedy suitable to the conditions and soils of Barbados will be available before damage becomes as severe as it was 15 to 20 years ago. The hand picking control then used is no longer feasible. Any reversion to this former scale of damage would have serious economic results.

The question of root mealy bug damage has benefited by further investigation. There is little doubt that serious damage depends on the type of soil and on soil moisture content over long periods: there is also, unfortunately, little doubt that the pest is spreading from foci of heavy infestations which are mainly in the central hills, and usually best rainfall parish of St. Thomas. The life of many ratoon fields is abruptly shortened where infestation is heavy and the soil conditions suitable, namely, light soil in good tilth. Plant cane fields are rarely visibly affected by either root borer or root mealy bug, owing to partial control by mechanical tillage and preparation prior to planting cane. It is expected that experiments now in progress will show that these pests can be economically controlled by timed applications of soil insecticides, thus preventing sudden ratoon failures and possibly lengthening the ratooning period.

The soil treatments now in large scale experimental stage are expected to control all cane root pests: for if root borer can be controlled, then brown hard back (*Clemora smithi*), root mealy bug (*Rhizoecus* n.sp) and Termite damage will also be controlled. The standard aimed at is that of killing root borer grubs before they can penetrate into the root stem portion of the cane stools: when that is accomplished it may be possible to recommend variations in the treatments according to type of soil and nature of cane root pest.

Control over the small moth borer *Diatraea saccharalis* was maintained. Over 3 million *Sitotroga* eggs plus several thousand *Trichogramma minutum* were sent by special request to the United States of America for the purpose of starting up *Trichogramma* breeding. This was an exception due to special and repeated requests and will probably not be repeated because the biological control measures suited to and successful in Barbados, may be ineffective under continental conditions.

Control Meaures against Root Borer—Diaprepes abbreviatus.

Field scale experiments using technical aldrin diluted with 60 mesh powdered coral limestone were laid down in 1951, each treated acre receiving 4 lb. of aldrin harrowed in to a depth of 4 to 6 inches: i.e. 4 lb. of aldrin were mixed with approximately 2,000,000 lb. of soil. The full acreage planned could not be treated owing to heavy rainfalls which made many fields unsuitable for tractor harrowing, and to insufficient estate mechanisation for all fields to be treated when weather conditions did become suitable. The necessity for planting some treated fields with root food crops also complicated matters and lessened the chances of uniformity of treatment.

The first results to show from these treatments were negative; that is, as the plant canes grew in the various aldrin treated fields (half of each treated field received 4 lbs. of aldrin and the whole of each field was harvested) no difference in growth could be seen between treated and untreated halves. To this there were two exceptions; in one case the cane plants died out and two or three replantings were necessary in the aldrin treated portion, because of root borer attack; and in the second case, the plant canes developed an excessive attack (100% stalks bored) of moth borer *Diatraea saccharalis*. Similar, but not so severe, attacks of *D. saccharalis* showed in other aldrin treated fields.

For these and other reasons given in the 1951—52 Report, attention was turned to high gamma content gammexane dusts and both pot and randomised plot experiments were started to see whether sugar cane and sweet potato growth would be adversely affected by high (up to 13 lbs. gamma isomer in 1 ton of milled coral dust per acre) dosages of gamma isomer. The results were satisfactory; cane growth was, if anything, stimulated; there was no lime chlorosis and no taint in sweet potatoes up to 8 lb of gamma isomer per acre. At 13 lb. gamma isomer or over, per acre, there was slight tainting of sweet potatoes, but not enough to make them inedible. There was, however, interference with growth of the tubers and reduction in yield; there was also stunting of corn grown in high gamma treated land, but there was also some suppression of weeds.

Unfortunately, all of the randomised cane plot experiments at Codrington Experimental Station had to be dug up before reaching the ratooning stage of growth because the land was needed for the cane breeding programme.

The evidence was, however, considered sufficient to warrant the large scale experimental use on estates of 13 lb. of gamma insomer in ½ ton of diluent per acre.

These experiments were laid down in 1952, and more extensive ones planned for 1953.

The growth of 1952 gammexane treated plant canes which are to be reaped and ratooned in 1954, coincided with the reaping and ratooning of the 1951 aldrin fields.

The tonnages of plant cane reaped from the aldrin treated areas showed an average increase of four tons of cane per acre. The figures were 34.68 tons per acre average from 29.48 aldrin treated acres and 30.66 tons average per acre from 30.91 control acres. There were variations, some in favour and some adverse to aldrin treatment, due possibly to differences in soil texture

and fertility in the treated and untreated portions of each of the various fields but the averages were as given above. One field showed 3.37 tons per acre positive results for aldrin in plant cane tonnage due definitely to attack by and control of root borer. The 1953 ratoons in the same field gave obvious visual difference in growth at first, but because a root crop had been planted between cane rows after treatment in 1951, thus removing some aldrin when the root crop was dug up in 1952, the control ratoons in 1953 partially succumbed to the root borer attack. In another field, root borer attack was not apparent in 1952. In this field no root crops or other provisions were planted in 1951 and in the ratoons now growing in 1953 a clean cut visual line of growth due to root borer control shows in favour of aldrin treatment. Photographs have been taken for record of the advantages of soil treatment and of the disadvantage of planting root crops in treated areas.

At the same time the young *plant canes* growing in fields treated with 13 lb. gamma isomer in 1952 are showing in 1953 a visual growth similar to the aldrin ratoons, but in young plant canes and at present with no adverse cases as experienced with aldrin.

It would appear therefore that the soil treatment methods so far tested on plantation field scale will give positive control results, and that the question of using aldrin or gammexane will depend upon final cost and relative cane tonnage increases per acre for expenditure in B.W.I. dollars and for compatability with the compulsory food growing programme in estate fields.

There can be no question that *Diaprepes abbreviatus* must be controlled once again, but this time by soil chemicals and mechanisation and not by organised and co-operative hand picking of adult beetles.

Cane Root Mealy Bug — Rhizoecus n.sp.

As previously stated, this pest is spreading, but severe damage to ratoons appears to be limited to high rainfall red soil areas. When the mealy bug and its associated ant *Acropyga marshalli* appear in heavy black soils, infestation so far is scattered, slight, and at present unimportant.

A planned experiment campaign against *Rhizoecus* and *Acropyga* was not possible until 1953, except for a few cases in which fields earmarked for root borer control treatment in 1952 were found to have moderate amounts of yellow ant and mealy bug in them as well.

In 1953, however, funds and material were available to carry out separate treatments on an increased estate scale. By that time ratoon fields of various ages were dying in some areas; either completely or in patches. The problem of early ratoon fields dying or becoming yellow and stunted in patches, despite applications of fertilisers raised a special problem, namely, that of treating such patches and so not only saving the field, but preventing further spread of the pest. These treatments of bad patches ranging from one quarter to one acre in extent scattered in fields had to be surface treatments carried out by hand after removal or 'rowing' of cane trash; after application of gammexane dust, the trash was respread over the surface. Such treatment depends on rain falling shortly after treatment in order to carry the insecticide into the *Acropyga* tunnels in the ground; so far preliminary results have been most encouraging. Another trial being carried out is to put one plough cut through the cane bank and then apply gammexane dust at 13 lb. gamma isomer

per acre, by means of a tractor drawn distributor, and replacing the trash on the experimental ground. Ploughing between cane rows may, however, be risky if prolonged dry weather follows. Hand forking between rows has also been tried by planters; any successes, as have been claimed, appear to be due to breaking up the ant and mealy bug association and are not likely to be permanent, any more than digging up root borer infested patches in fields and replanting with stumps or 'mother shoots' is a permanent cure for root borer attacks.

Large scale treatments are being carried out in 1953 with a view not merely of saving fields in which 'patches' have appeared, but of getting the pest under complete and economic control.

As in the case of root borer trials, which were started years earlier, the amount per acre and type of insecticide used will depend upon availability of material and cost per acre of treatment.

Moth Borer — Diatraea saccharalis.

Biological control by destroying *D. saccharalis* eggs over a critical period of cane growth each year continues to control moth borer in sugar cane. The total liberations of *Trichogramma* parasites for 1952 was 407,682,000, but average cane internode infestation rose to 11.2% after having dropped to around 8% for the two previous years. Some of this increase may be due to new varieties of cane which replaced the long established B.37161 in some areas. Factory count records all show that the average infestation of these new varieties was greater than that for B.37161.

Work on the relation between *D. saccharalis* infestation and cane varieties was maintained as usual, as was the work carried out annually on extent of *D. saccharalis* egg deposition in different varieties of cane, and in extent of field parasitism by *T. minutum.*

Imported Parasites and Predators

Consignments of the corn ear-worm parasites *Archytas piliventris, Winthemia* sp. and *Eiphosoma* sp. were received from the Commonwealth Bureau of Biological Control, Trinidad, and were distributed in corn fields of the right growth and infestation. No recoveries were made from over eight hundred corn ear worm larvae collected during subsequent months.

A consignment of 300 adults and 100 larvae of *Hyperaspis trilineata* for control of cane stalk mealy bug *Trionymus sacchari* was collected and sent from Barbados to Trinidad.

A list of the Insects of Barbados which had been compiled over the last 25 years was printed in the Journal of Agriculture of the University of Puerto Rico in October 1952.

Wood Ant Control.

The duties of the Wood Ant Inspector have been supervised and accounted for as in previous years.

General entomological and zoological services were maintained as usual.

SECTION VII.

PLANT DISEASES AND COTTON

By

D. R. D. WILES,
Plant Diseases Inspector

Mosaic Disease of Sugar Cane

Due to the planting of the Island's crop in highly resistant cane varieties no infected canes were reported.

Mosaic symptoms were observed on certain varieties of fodder grasses during the period under review and these susceptible varieties have been replaced by resistant or immune varieties.

Cotton

Unfortunately, in December 1951, the presence of fresh pink bollworm was observed; as the attack was slight it was considered advisable to adhere to a period of two months for the Close Season of Okra and Cotton. This Close Season was fixed for the months of May and June 1952. As an extremely good price for cotton was being obtained it was expected that a greater acreage would have been planted, but seed was only distributed to plant 290 acres made up as follows :— plantations—18; peasants—272; of which only 217 acres were reaped with the undermentioned result :—

Seed Cotton — 77,561 lb.

Lint — 19,549 lb.

Ginning percentage — 25.20%

The cotton growers availed themselves, to a greater extent, of the supply of Sulphate of Ammonia through the Barbados Co-operative Cotton Factory Ltd., and this possibly accounts for the high ginning percentage although the average yield of seed cotton per acre is low.

Cotton Selection

Cotton variety trials were continued at Codrington, Trial A being planted in the following varieties, viz., B.4310, B.4404, B.4411, B.4706, B.4805, B.4807, B.4905, B.5006 and B.1 as standard. Trial B was planted in the following varieties, viz., B.1(3), B.4902, B.5005, B.5101, B.5102, B.5103, B.5104, B.5105, B.5107 and B.1 as standard.

Selection of seed for planting the Progeny Row trials was made from strains of the following varieties, viz., B.4310, B.4404, B.4411, B.4413, B.4706, B.4905 from which good yields had been obtained.

Greater care has been taken in the preparation of the seed cotton by growers and as a result no bales were rejected by the Liverpool graders, top price being obtained for the Island's crop.

Cotton Pests and Diseases

In order to maintain a pure strain of Sea Island Cotton, search was continued throughout the Island for the presence of "Wild Cotton" trees for the period under review and 2,944 of them were found and destroyed.

The attack of defoliating worm, *Aletia argillacea*, which occurred was slight, being easily controlled by dusting or spraying.

The presence of pink bollworm was again observed during the year to a greater extent than in the previous year.

Plant Pest and Disease (Importation) Act

Twenty (20) permits were issued under this Act to import planting material.

Plant Export Certificates

Eighty-nine (89) export certificates were issued during the year.

Miscellaneous Inspections of Imported Planting Material.

218	packages of bulbs, vegetable & flower garden seeds and Rose trees	— examined & passed
7	Pear trees	— ,, ,,
12	Mango trees	— ,, ,,
13	packages Rose trees	— ,, ,,
1	case Rose trees	— ,, ,,
96	Rose trees	— ,, ,,
5	packages Lily plants	— ,, ,,
9	cases Bulbs	— ,, ,,
2	packages Bulbs	— ,, ,,
1	package Pineapple plants	— ,, ,,
1	case Orchids	— ,, ,,
136	packages Orchids	— ,, ,,
1	Palm	— ,, ,,
1,866	Coconut plants	— ,, ,,
1	Fern	— ,, ,,
6	Citrus plants	— ,, ,,
1	package Citrus plants	— ,, ,,
3	packages Miscellaneous plants	— ,, ,,
23	packages Ornamental plants	— ,, ,,
3	cases Carnation plants	— ,, ,,
2	packages Gerbera plants	— ,, ,,
1	package Hydrangea plants	— ,, ,,
1	package Cacti plants	— ,, ,,
1	package Nutmeg plants	— ,, ,,
2	packages Sweet Corn seed	— ,, ,,
67	bundles Xmas trees	— ,, ,,
1	package Ornamental plants	— Roots washed
60	Nutmeg plants	— ,, ,,
207	Coconut plants	— Refused entry and returned to country of origin

In addition to the above, 200 bales of cotton lint and 2,567 bags of Cotton Seed Meal were also inspected.

SECTION VIII.

ANIMAL HEALTH

By

M. B. PROVERBS

Veterinary Officer

During the year the health of Government owned livestock has been maintained at a satisfactory level. The high incidence of sterility in dairy cattle has received a great deal of attention during the period under review and Trichomoniasis has been demonstrated as a major factor causing sterility.

Investigations into existing animal and poultry diseases throughout the Island have been continued.

Review of Diseases:

(1) Mastitis in Dairy Cows:

The incidence of mastitis at the Central Livestock Station, District Agricultural Stations and the Mental Hospital Dairy Farm has continued to decrease. Preventive measures recommended have also been employed with very satisfactory results in some of the privately-owned dairies where mastitis had become a major problem.

(2) Sterily in Dairy Cows:

The causes of sterility in dairy cattle have been further investigated and a widespread distribution of Trichomoniasis throughout the Island has been discovered. The popular local practice of using communal bulls has been responsible for this spread of venereal disease and every effort is being made to popularise the use of artificial insemination using semen from bulls which have never been allowed natural service.

Three of the larger dairies in the Island, which were all experiencing abortions and a high incidence of sterility in their herds, were found to have infected bulls. Infected cattle were treated and given sexual rest and have since been artificially inseminated with very promising results. Some infected animals are, however, difficult to get in calf due to a chronic endometritis.

The conception rate of the cattle at the Central Livestock Station and District Agricultural Stations and the Mental Hospital has improved considerably during the last few months.

(3) Trichomoniasis:

After a considerable amount of work on the causes of sterility in dairy cattle, particularly at the Central Livestock Station, it was found that some of the pure bred imported bulls were infected with Trichomoniasis. The clinical symptoms manifested were not characteristic of this disease, and instead of frequent, early (2 to 3 months) abortions and characteristic vaginal discharges, the only indication shown was the fact that several services or inseminations were required to get each animal in calf. Organisms were only recovered from one cow and frequent douchings, and eventually cultures, had to be carried out in order to demonstrate the infection in bulls.

It was subsequently found that all the bulls, except one, which were kept at the District Agricultural Stations for stud purposes, were infected. They have since been sold for slaughter.

As a result of investigations, it is possible to state with certainty that Trichomonas infection in cattle is widespread throughout the Island, and although the significance of losses sustained as a result of infection is not as a rule generally realised, the cumulative effect of infertility, abortions, lowered milk yields and fewer calves produced, must severely affect the potential output of the dairy industry of the Island.

In order to combat this infection it has been decided to abandon the use of natural service by communal bulls at the various stations, and employ instead artificial insemination using bulls which are maintained at the Central Livestock Station and which have never therefore been exposed to the risk of contracting venereal disease.

The Peasant Agricultural Instructors have undergone a course of instruction in the technique of artificial insemination and the results being obtained are entirely satisfactory.

During the year inseminations were performed at the various stations as follows:— Central Livestock Station — 410*; Groves — 310; The Home — 204; Bullen — Nil; Jerusalem — 196; Haggatts — 24; Sayes Court — 52.

(4) Johne's Disease:

During the year two cows at the Central Livestock Station were found to be affected with Johne's disease which was confirmed by microscopic findings. The animals were both slaughtered.

(5) Foot and Mouth Disease:

In December, it was notified that an outbreak of Foot and Mouth disease had occurred in Martinique. A conference was immediately convened in Trinidad and Veterinary Officers from the British Caribbean territories met to formulate unified legislation in an effort to prevent spread of the disease to any British territory. Measures were also discussed for dealing with the disease in the event of its introduction into any British territory.

The outbreak of Foot and Mouth disease in Canada was eradicated during the period under review and legislation prohibiting importations of meat and meat products from infected areas in Canada was lifted.

(6) Fowl Cholera and Fowl Typhoid:

The severe epidemics of Fowl Cholera and Fowl Typhoid which occurred in the Island last year have now been eradicated. Hundreds of birds were vaccinated against the diseases with excellent results. Many other West Indian territories are still suffering losses and it is proposed to recommend legislation controlling the importation of poultry in an effort to prevent re-introduction of the diseases.

Importation of Meat and Meat Products.

Regulations controlling the importation of meat and meat products were enforced during the year and it is now necessary to obtain a permit from the Department of Agriculture in order to import into the Colony any meat or meat products. Permits are only granted in respect of certain scheduled territories and these permits specify the various meat inspection certificates which are required to accompany such importations.

* This figure does not include inseminations performed on government-owned livestock.

TABLE I.

Veterinary Inspection of Animals prior to Export.

Dogs	Goats	Sheep	Cats	Rabbits	Geese	Horses	Budge-rigas	Para-keets	Pigs	Heifers	Bulls	Pigeons	Guinea Birds	Canaries
67	40	30	7	32	6	77	2	2	6	5	1	7	6	1

TABLE II

Veterinary Inspection on Arrival of Imported Animals

Dogs	Cats	Horses	Asses	Pigs	Mules	Bulls	Monkeys
15	4	83	3	7	1	1	2

SECTION IX

FISHERIES

By

D. W. WILES
Fishery Officer

The work of the Fisheries Division is reviewed under the following heads:—

A. Loans to Fishermen.

B. Research Work.

C. Conferences.

D. Improvement at Beaches.

E. Markets and Marketing.

F. Cold Storage Consideration.

G. Introduction of 1952 Fishing Industry Act.
   (a) Registration of Fishing Boats;
   (b) Registration of Fishermen;
   (c) Loss of Boats;
   (d) Loss of Life.

H. Rebuilding Boat Programme due to disaster of December, 1951.

I. General.

A. Loans to Fishermen.

Under the provision of the Fishing Industry Act, seventy-one (71) loans were granted amounting to $14,155.24, for repairing and refitting sixty-four (64) boats, and building seven (7) others.

Repayments for the year amounted to $10,502.51, of which $2,911.59 was repaid to Redemption of Loans and $7,590.92 to the Revolving Fund. The following is a statement of loans issued and repaid since the inception of the loan scheme:—

	Amt. actually expended $	*Amt. repaid* $	*Balance* $
Redemption of Loans	77,788.69	62,214.82	15,573.87
Revolving Fund	55,683.50	21,938.03	33,745.47
	$133,472.19	$84,152.85	$49,319.34

B. Research Work

The research boat "Investigator" was used to continue investigations into the relation of the presence of plankton to the prevalence of flying fish. On the advice of the Adviser on Fisheries to the Secretary of State for the Colonies, a detailed study was made of this subject by a Specialist Officer, Mr. D. N. F. Hall, Ph.D., who arrived in the Island in February and devoted three months to the investigation work.

A report by Mr. Hall is expected during the coming year.

C. Conferences

Towards the close of the last financial year, the Fishery Officer attended a Fisheries Conference which was held under the auspices of the Caribbean Commission at Kent House, Trinidad. Due to the lateness in the financial year, March 24th—28th, no remarks on this Conference were made in the last year's report of this Division. This Conference was the first to bring about a collective approach to fishery matters in the Caribbean Area. Delegates from many B.W.I. Colonies, French Caribbean Departments, Surinam, Puerto Rico and U.S.A., together with many observers from member Governments and Commission Territories, attended.

The report of this Conference which is called "Fisheries in the Caribbean" has been published and for the first time presents the fishery position of many of the territories of the Caribbean. A list of fish species showing to some extent the distribution of commercial species has also been compiled. This list also shows the local and colloquial name, the family or Genus, and the Habitat and occurrence when known. It is expected that this list will be amended and enlarged from time to time. This Fisheries Report now forms a basis for planning future development of fisheries in the Caribbean Area.

In November, 1952, the Fishery Officer attended the Fourth Annual Session of the Gulf and Caribbean Fisheries Institute, where a review of the "Fisheries in the Caribbean" was presented to the meeting. Marked interest was shown in this report and there have been many requests for copies.

Many valuable contacts were made at the abovementioned Conferences, and especially the contact made with Dr. Hilary Moore, Deputy Director of the Marine Laboratory, University of Miami. Dr. Moore is carrying out work on plankton research and has shown much interest in our local problems of relating the presence of plankton to the presence of flying fish. Dr. Moore offered many useful suggestions and gave the Fishery Officer a number of slides showing some of the plankton life of the Florida area, which would be of great assistance in identifying some of the local specimens. This gift of slides is much appreciated, as these slides could not have been made locally.

D. Improvement at Beaches.

During the year under review, a beach shelter was erected at Chapel Bay, in the Paynes Bay area, St. James. The site for this shelter was acquired during the previous financial year. This shelter is the fifth to be erected.

E. Markets.

The final stage was reached in the negotiations for the acquisition of a site for the proposed new Fish Market in Speightstown. Work on this market will start early in the new financial year.

Marketing:

Bridgetown Fish Market. Better use was made of the Bridgetown Fish Market during the period under review, and on many evenings and nights large quantities of fish were marketed through this market.

There has been a marked increase in the amount of fish taken during the year, as shown in Appendices I and II to this report.

It should, however, be remembered that these returns are compiled at the market for fish entering there before 6.00 p.m. and are in no way the total amount of fish handled at that centre.

Oistins Fish Market. A summary of the fish marketed through the Oistins Fish Market is shown at Appendix III. From this summary, it can clearly be seen that only a very small percentage of the fish landed at Oistins in present circumstances reach the market.

Beach Shelters. A summary of the amount of fish landed in areas where beach shelters exist, is shown at Appendix IV. These sheds are useful and are playing an important part in the better marketing of fish.

F. Cold Storage

The Fisheries Division has assisted with the preparation of plans for establishing a large-scale cold storage plant for fish. The Fishery Officer visited Puerto Rico in November 1952, in connection with this matter.

Cold Storage Experiments:

During the early months of the fishing season, a series of preliminary investigations were carried out with the object of determining the extent of the periods that fish might be stored locally under deep freeze temperatures at approximately 15°F.

1. A number of flying fish was stored; after having been cleaned and all bones removed, these fish were wrapped in waxed paper to retard evaporation. Samples were taken from this storage at bi-weekly intervals and found to be in good condition; they retained their quality up to 2 months. After that period, drying-out began to take place; fish taken from these samples after 2 months were yet in good condition, but were hard for eating purposes. It was determined that this drying-out could be minimised by glazing the fish or storing them in waxed sealed boxes.
2. Numbers of flying fish were wrapped and stored in open pans in a gutted condition with heads on. These fish maintained good quality up to 2 months, but after that time they also dried out and went off in flavour. Glazing tended to delay loss in flavour. This investigation was conducted along lines similar to those prevailing in a commercial storage plant.
3. Whole and ungutted flying fish have been successfully stored for periods up to six weeks. It is considered that glazing would extend the period of successful storage.
4. Trials were also made with the larger pelagic species, viz., Dolphin, King-fish, Bonita and Shark, and in every case the product was good up to 2 months before losing flavour due to drying-out.

G. Introduction of 1952 Fishing Industry Act

During the year, the Legislature passed a Bill entitled the Fishing Industry Act, 1952. This new Act replaces the Fishing Industry Control Act of 1947 and covers such matters as:— the registering of a fishing boat; the action with regard to change of ownership; the licensing of fishermen; loans to owners of fishing boats and regulations for their repayment; enquiry by Police Magistrate into loss, damage or casualty; powers of Police Magistrate in respect of charges of incompetency, etc.

(a) Registration of Fishing Boats:

During the fishing year 1952—1953, 421 boats were registered. It has not been appreciated by all boat-owners that their boats must be registered each year, hence the drop in registered boats over the previous year.

(b) Registration of Fishermen:

With the coming into operation of the Fishing Industry Act, 1952, one thousand and ninety-five (1,095) fishermen have been registered. To encourage the registration of fishermen, the Fishery Officer and his Assistant visited areas and registered many men on the spot. There are many fishermen who have not yet registered.

(c) Loss of Boats:

Eighteen (18) fishing boats were lost during the year as a result of sinkings at sea. One other boat was lost from its mooring.

(d) Loss of Life:

As a result of the abovementioned sinkings, it is reported with regret that eight (8) fishermen lost their lives.

H. Rebuilding Boat Programme

As a result of the rough surf of 2nd and 3rd December 1951, when some eighty-three (83) boats were damaged, thirty-six (36) of which were totally destroyed, the Fishery Division was busily engaged in the management of an extensive boat repair and bebuilding programme throughout the year under review.

Two emergency meetings were called by the Executive Committee. The Director of Agriculture and the Fishery Officer attended these meetings. A sum of $70,000.00 was voted by the Legislature as an estimate to cover this damage. This fund was granted on the condition that the Government would donate 50% of the cost of repairing or replacing these boats.

The repairing of the damaged boats along the western coast was organised first, in order to return as many as possible of the boats to the sea at the earliest opportunity. During this time, the Island's stocks of boat-building materials were hard pressed and many items had to be ordered specially to meet this emergency.

It was suggested by the Governor-in-Executive Committee that the opportunity be taken to introduce improvements to the boats that had to be rebuilt. Accordingly, plans of a suitable type of boat were discussed with Mr. R. A. Calvert, a sail boat designer. Mr. Calvert submitted a complete set of drawings for a boat of 22 ft. overall by 7′ 8″ beam, with a draft of 4′ 3″. to the Fisheries Advisory Committee.

The Committee accepted this design and the Fishery Officer was instructed to arrange for the building of all boats for use on the western coasts on these lines.

In order to undertake the building of some thirty boats at the Reef, it was necessary to establish a boat yard with sheds, benches and electrically-power-driven tools.

During this period, trees were also being felled at Summervale, St. Philip, and transported to the Reef, where a number of workmen were engaged in slabbing these logs into suitable sizes for the machines. It is encouraging to record that after all these preparations, the first keel was laid on 29th March 1952, and twenty-nine boats of the Calvert type were built and launched by 14th February 1953. These boats are accepted generally as being well constructed—the workmanship being some of the best seen in these parts. These boats are fitted with a keel weighing approximately 1,000 lb. made up of scrap iron and concrete, as a better means of stability than inboard ballast.

The Fishery Officer introduced an added improvement, which permits one man to lower or hoist a mast in one of these boats. This feature has been greatly appreciated by the fishermen using these boats.

I. Importation of Lumber

During October—November of 1952, it became evident that the Lumber Merchants were reluctant to import certain types of lumber generally required for the maintenance of the Fishing Industry. A meeting was arranged between the Chairman of the Lumber Control Board, the Director of Agriculture and the Fishery Officer. At the meeting, the Chairman of the Lumber Control Board declared the future policy of the Lumber Merchants; thereupon, the Government was left with no alternative but to import certain selected sizes in pitch pine and fir.

A sum of $3,500.00 was allocated from the Fisheries Revolving Fund to finance these shipments of lumber. Orders were placed with the Government of British Honduras and America, through local Agents.

Two shipments of forty (40) pieces each of pitch pine, suitable for boat masts were received from America and have been sold to boat-owners. Due to poor shipping connections, the shipment from British Honduras is still outstanding. These eighty (80) masts have played an important part in keeping many boats in the water that otherwise might well have had to be hauled in.

Appendix I

FISH MARKETED THROUGH THE BRIDGETOWN FISH MARKET FOR PERIOD APRIL 1952 — MARCH 1953

Month	No. of Boat Landings	Bream Snapper and other Deep Sea Fish	Dolphin (lb.)	King Fish (lb.)	Marlin (lb.)	Shark (lb.)	Albacore (lb.)	Tuna and Bonita (lb.)	Seine Fish (lb.)	Pot Fish lb..)	Flying Fish (lb.)	Total (lb.)
1952												
April	490	—	13,228	984	1,565	7,543	1,813	403	816	—	42,399	68,751
May	234	510	4,196	891	245	3,303	2,950	290	190	30	29,400	42,005
June	159	51	2,792	293	1,283	1,630	2,151	265	966	—	16,910	26,341
July	41	260	439	17	445	1,784	445	115	2,730	260	560	7,055
August	9	—	30	—	—	—	—	—	2,112	—	—	2,142
September	7	120	—	345	—	50	—	—	60	100	—	675
October	7	—	—	880	—	—	100	—	—	—	—	980
November	25	—	—	628	693	345	295	105	—	154	800	3,020
December	255	60	2,351	1,386	677	2,655	1,402	—	395	—	39,756	48,682
1953												
January	434	40	655	252	891	4,625	2,133	415	—	—	80,765	89,776
February	363	—	3,853	669	574	7,260	657	—	—	—	37,930	50,943
March	621	—	9,514	1,801	1,481	12,338	1,604	401	—	180	90,240	117,559
	2,645	1,041	37,058	8,146	7,854	41,533	13,550	1,994	7,269	724	338,760	457,929

Appendix II

SUMMARY OF FISH MARKETED THROUGH THE BRIDGETOWN FISH MARKET COMPARING CATCHES MARKETED DURING THE FIRST SIX MONTHS OF THE 1951 AND 1953 FISHING SEASON

Month	No. of Boat Landings	Bream Snapper and other Deep Sea Fish	Flying Fish (lb.)	Dolphin (lb.)	King Fish (lb.)	Marlin (lb.)	Shark (lb.)	Albacore (lb.)	Tuna & Bonita (lb.)	Seine Fish (lb.)	Pot Fish (lb.)	Total (lb.) for Year 1951	Total (lb.) for Year 1953
January 1951 ...	146	40	10,095	2,360	754	607	2,883	1,568	60	—	—	18,367	—
„ 1953 ...	434	—	80,765	655	252	891	4,625	2,133	415	—	—	—	89,736
February 1951 ...	157	110	7,634	9,533	1,123	146	1,975	483	25	—	140	21,169	—
„ 1953 ...	363	—	37,930	3,853	669	574	7,260	657	—	—	—	—	50,943
March 1951 ...	283	—	9,049	21,264	576	757	12,978	1,592	386	—	—	46,602	—
„ 1953 ...	621	—	90,240	9,514	1,801	1,481	12,338	1,604	401	—	180	—	117,559
April 1951 ...	312	—	13,430	29,728	846	1,424	8,745	1,998	487	205	—	56,863	—
„ 1953 ...	586	—	80,497	32,450	5,067	2,992	10,890	10,343	1,396	—	—	—	143,635
May 1951 ...	329	—	26,462	17,111	160	2,509	7,216	1,142	438	386	80	55,504	—
„ 1953 ...	246	—	53,320	2,860	210	619	3,560	7,040	505	—	—	—	68,114
June 1951 ...	80	—	2,250	1,968	70	530	1,713	376	200	90	—	7,197	—
„ 1953 ...	113	—	15,210	1,004	45	85	1,050	8,634	310	140	—	—	26,478
	13,670	150	426,882	132,300	11,573	12,615	75,233	37,570	4,623	821	400		
Total—First 6 months of 1951												205,702	
Total—First 6 months of 1953													496,425

Appendix III

SUMMARY OF FISH MARKETED THROUGH THE OISTINS FISH MARKET FOR PERIOD APRIL 1952 — MARCH 1953

Month	No. of Boat Landings	Bream & Snapper (lb.)	Any other Deep Sea Species	Flying Fish (lb.)	Dolphin (lb.)	King Fish (lb.)	Marlin (lb.)	Shark (lb.)	Albacore (lb.)	Seine Fish (lb.)	Pot Fish (lb.)	Total (lb.)
1952												
April	138	—	—	7,633	2,858	102	—	1,389	95	—	—	12,079
May	81	—	80	4,839	1,407	98	40	665	—	20	100	7,249
June	42	—	20	3,203	438	42	284	118	—	670	—	4,775
July	40	1,759	—	—	108	—	—	157	—	2,653	—	4,677
August	42	2,444	—	—	21	—	—	—	—	360	—	2,825
September	22	1,531	—	—	—	—	—	32	—	—	—	1,563
October	17	1,175	—	—	—	27	—	100	—	80	—	1,382
November	25	600	—	378	202	96	142	544	—	—	—	1,962
December	79	—	—	7,062	417	225	126	832	328	—	—	8,990
1953												
January	46	—	—	6,207	235	139	64	287	—	—	—	6,932
February	49	—	—	2,875	959	37	—	1,136	442	—	—	5,449
March	82	—	—	18,955	964	232	70	798	—	—	—	21,019
	663	7,509	100	51,152	7,609	998	726	6,058	865	3,783	100	78,902

Appendix IV

SUMMARY OF FISH MARKETED THROUGH BEACH SHELTERS FOR PERIOD APRIL 1952 — MARCH 1953

District	Approx. Weight (lb.)	Number of Resident Boats
Reid's Bay, St. James	33,775	14
Payne's Bay, St. James (November, 1952 to March, 1953)	44,152	21
Consett's Bay, St. John	63,389	19
Martin's Bay, St. John	63,142	6
Skeete's Bay, St. Philip	105,136	21
	309,594	81

Appendix V

ESTIMATED LANDINGS OF FISH (lb.) WITH APPROXIMATE VALUES

Year	Pounds	Value ($)
1951	6,359,760	953,964.00
1952	9,211,650	1,381,747.00
1953 (January—June)	14,892,750	2,233,912.50

PART IV.

FINANCIAL STATEMENT

Expenditure and Revenue for the Financial Year 1952—53

EXPENDITURE

Recurrent

Personal Emoluments	$ 141,388.81
Travelling Allowances	22,104.21
Exhibition Expenses	998.25
Expenses in Control of Cotton Diseases (Salaries of Sub-Inspectors	4,069.16
Unforeseen Contingencies	95.98
Stationery	1,452.38
Library	534.60
Destruction of rats and beetles	1,070.91
Experimental Stations	61,827.93
Chemical Laboratory	5,682.46
Entomology	14,665.49
Fisheries	12,774.07
Veterinary	733.42
Government Lands (Upkeep and Purchase of Grass)	397.30
Pine Plantation and Central Livestock Station	130,600.63
District Agricultural Stations	56,210.16
Propagation of Trees	1,811.10
Tax Contribution Payments	1,150.71
	$ 457,567.97

Non-Recurrent

Equipment for Veterinary Laboratory	$ 232.25
„ „ Chemical Laboratory	1,863.99
Furniture and Equipment	1,503.65
Agricultural Development Schemes	7,549.15
Garden Book of Barbados	1,500.00
Lamps and Safes for District Agricultural Stations	708.83
Anemometer	202.85
Repairs to Yard at Codrington Experimental Station	1,063.55
Weighing Machine	300.00
Refrigerator	542.70
Radio Telephone Equipment	487.83
Loans to Tenants at Seawell	1,835.40
Control of Mealy Bug and Ant Pest	2,296.68
	$ 20,086.88

FINANCIAL STATEMENT (Concluded)

REVENUE

Codrington Experiment Station—Field Produce	$ 11,606.64
Botanic Station:	
Ornamental & Useful Plants	1,220.59
Deposits on plant pots	1,100.10
Vegetable Seed & Insecticides	17,033.99
Chemical:	
Analyses of Miscellaneous Samples	401.76
Entomological:	
Fumigation of bags for export	109.20
Sale of old wheat	294.00
Inspection of private buildings for Wood Ants	134.40
Pine Plantation & Central Livestock Station	85,387.92
District Agricultural Stations	20,672.28
Co-operatives—Fees, etc.	43.78
	$ 138,004.66

PART V.

AGRICULTURAL LEGISLATION

The West Indian Sea Island Cotton (Exemption from Duty) Act 1952.

Under the provisions of this Act, all articles made from Sea Island Cotton and accompanied by a declaration were admitted into this Island free of Customs duty for a period of one year.

The Fishing Industry Act, 1952

The object of this Act is to make provision for assisting the fishing industry and for the protection of persons engaged therein.

Among the matters provided for, are the registration of fishing boats and the keeping of a register of all licences issued to fishermen.

An important provision is the issuing of loans, under certain conditions, to owners of fishing boats for the purpose of repairing or completing the construction of fishing boats as well as for the purchase of material, gear and tackle for such boats.

The Governor-in-Executive Committee is empowered to make regulations for carrying out the provisions of this Act. These regulations are, however, subject to approval by both Houses of the Legislature before they become law.

PART VI.

LIST OF PUBLICATIONS ISSUED BY THE DEPARTMENT OF SCIENCE AND AGRICULTURE AND B.W.I. CENTRAL SUGAR CANE BREEDING STATION FROM 1925 TO DATE

Department of Science and Agriculture

Reports

Report on the Sugar Cane Experiments for the season between 1923—25, by J. P. D'Albuquerque, M.A., F.I.C., F.C.S.

Report on the Sugar Cane Experiments for the Season between 1924—26, by J. P. D'Albuquerque, M.A., F.I.C., F.C.S.

Report on the Dept. of Agriculture, Barbados, 1925—26.

Annual Report of the Department of Agriculture, 1926—27.

Report of the Department of Agriculture, Barbados, 1927—28.

Annual Report of the Department of Science and Agriculture, 1928—29.

Report of the Department of Science and Agriculture, Barbados, 1929—30.

Report of the Department of Science and Agriculture, Barbados, 1930—31.

Agricultural Journals:

Vol. 1, No. 1, Jan. 1932 (out of print)	An Investigation into the Evolution of Sugar Cane Varieties by Breeding in Barbados, 1887—1925, with a discussion on the application of the Findings to the present day Scheme of Work, by A.E.S. McIntosh, B.Sc., Ph.D.
	A Survey of the Position of *Phytalus smithi*, Arrow and its Natural Enemies in Barbados, by R. W. E. Tucker, M.A., B.Ed.
	The Scientific Control of Pan Boiling, by S. J. Saint, M.Sc., Ph.D.
	The Status of *Trichogramma* as a control of *D. saccharalis* in Barbados, by R. W. E. Tucker, M.A., B.Ed.
	The Inversion of Sucrose in Syrup Manufacture, by C. A. Coppin, B.A.Sc.
	Some Aspects of the Flora of Barbados, by F. Hardy, M.A., F.G.S.
	Memorandum on the Cotton Situation in Barbados.
Vol. 1, No. 2, April 1932	Report on the Work of the Department of Science and Agriculture for the Year Ending June 30, 1932.
	Some Aspects of the Flora of Barbados (Cont'd) by F. Hardy, M.A., F.G.S.
Vol. 1, No. 3, July 1932	Report of the Geneticist for 1931—32. Some Aspects of the Flora of Barbados (Cont'd.) by F. Hardy, M.A., F.G.S.

Vol. 1, No. 4, Oct. 1932.	A Discussion of the Results of Manurial Trials carried out on Sugar Cane in Barbados, 1928—32. Some Aspects of the Flora of Barbados, by F. Hardy, M.A., F.G.S. .
Vol. 2, Nos. 1 & 2, April 1933.	Some Aspects of the Flora of Barbados (Cont'd) by F ardy, M. A., F.G.S. Year Ending June 30, 1933. Some Aspects of the Flora of Barbados (Concluded) by F. Hardy, M.A., F.G.S.
Vol. 2 No. 3, July 1933.	Report of the Geneticist for the Year 1932—33.
Vol. 2, No. 4, Oct. 1933.	Manurial Trials with Sugar Cane, by S. J. Saint, M.Sc., Ph.D. Rate of Egg Deposition of *D. saccharalis* and Extent of Larval Mortality in Canefields and their relation to Control of *Diatraea* by *T. minutum*, by R. W, E. Tucker, M.A., BEd. Varietal Factors in Cane which may influence extent of Oviposition by *D. saccharalis* and a possible method for Determining Varietal Susceptibility to Borer attack, by R. W. E. Tucker, M.A., B.Ed.
Vol. 3, No. 1, Jan. 1934.	Sugar Cane Growth Measurements in Barbados, by A E. S. McIntosh, B.Sc., Ph.D. A Contribution towards the Solution of the Problem of Control of the real mortality of *D. saccharalis* due to egg parasites, predators. natural larval mortality, larval parasitism and other factors, by R. W. E. Tucker, M.A., B.Ed.
Vol. 3, No. 2, April 1934.	Report on the Work of the Department of Science and Agriculture for the Year Ending March 31, 1934.
Vol. 3, No. 3, July 1934.	The Coral Limestone Soils of Barbados by S. J. Saint, M.Sc., Ph.D.
Vol. 3, No. 4, Oct. 1934. (out of print)	Report of the Geneticist for the Year 1933—34. A further Contribution to the Analysis of Field Data on *D. saccharalis* in Barbados, by R. W. E. Tucker, M.A., B.Ed.
Vol. 4, No. 1, Jan. 1935 (out of print)	Manurial Trials with Sugar Cane. The Control of *D. saccharalis* in Sugar Cane in Barbados by frequent liberation of mass-reared *Trichogramma*, by R .W. E. Tucker, M.A., BEd.
Vol. 4, No. 2, April 1935	Report on the Work of the Department of Science and Agriculture for the Year ending March 31, 1935.
Vol. 4, No. 3, July 1935.	Report of the Geneticist for the Year 1934—35.
Vol. 4, No. 4, Oct. 1935.	Manurial Trials with Sugar Cane. Sugar Cane. A Summary of Plantation Variety Yield Returns for Season 1933—35, by A. E. S. McIntosh, B.Sc., Ph.D. Juice Analyses in Relation to the Fertilizer Requirements of Barbados Soils by S. J. Saint, M.Sc., Ph.D.
Vol. 5. No. 1, Jan. 1936. (out of print)	Parasites Introduced into Barbados for Control of Insect Pests, by R. W. E. Tucker, M.A., B.Ed. Investigations into the Use of the Zeiss Hand Refractometer, by A. E. S. McIntosh, B.Sc., Ph.D., and G. C. Stevenson, B.A.
Vol. 5 No. 2, April 1936.	Report on the Work of the Department of Science and Agriculture for the Year Ending March 31, 1936.
Vol. 5 No. 3, July 1936	The Yield of Sugar Cane in Barbados in 1936. Report of the Botanist for the Year 1935—36.
Vol. 5 No. 4, Oct. 1936. (out of print)	A Preliminary Investigation into Cane Varieties and Infestation by *D. saccharalis*, by R .W. E. Tucker, M.A., B.Ed.

Manurial Trials with Sour Grass, by S. J. Saint, M.Sc., Phd.
Manurial Trials with Sugar Cane, by S. J. Saint, M.Sc., Ph.D.
Sugar Cane Spacing Experiments, by G. C. Stevenson, B.A.

Vol. 6 No. 2, April 1937. (out of print)
Report on the Work of the Department of Science and Agriculture for the Year Ending March 31, 1937.

Vol. 6 No. 3, July 1937.
The Yield of Sugar Cane in Barbados, 1937.
Report of the Botanist for the Year 1936—37.

Vol. 6 No. 4, Oct. 1937. (out of print)
The Control of Scarabee in Barbados, by R. W. E. Tucker, M.A., B.Ed.
Larval Dispersion of *D. saccharalis*, by R .W. E. Tucker, M.A., B.Ed.

Vol. 7 No. 1, Jan. 1938.
Manurial Trials with Sugar Cane, by S. J. Saint, M.Sc., Ph.D.
An Account of an Experiment to Determine the Efficiency of two Weed-killing Sprays.
Experiments with the Dwarf Banana.
String Bean Variety Trial, Codrington, 1937.
Experiments in the Use of Hortomone A to Stimulate Rooting and Establishment in Cutting of Ornamental Plants.

Vol. 7 No. 2, April 1938. (out of print)
Report on the Work of the Department of Science and Agriculture for the Year Ending March 31, 1938.

Vol. 7 No. 3, July 1938.
The Yield of Sugar Cane in Barbados in 1938.
Report on Sugar Cane Breeding and Seedling Testing for the Year 1937—38, A. E. S. McIntosh, B.Sc., Ph.D.

Vol. 7 No. 4, Oct. 1938. (out of print)
Experiments in the Growing of Tomatoes and shipment to Canada.
Co-operative Sugar Cane Spacing Experiments.
Sweet Potato Storage Experiments.

Vol. 8 No. 1, Jan. 1939.
Manurial Trial with Sea Island Cotton, by S. J. Saint, M.Sc., Ph.D.
Cotton Growing and Cotton Pests Control, by R. W. E. Tucker, M.A., B.Ed.
The Control of *D. abbreviatus*, L. and L. (*Phytalus*) *smithi*, Arrow, in Barbados, surveyed over a period of eleven years, by R. W. E. Tucker, M.A., B.Ed.

Vol. 8 No. 2, April 1939.
Report on the Work of the Department of Science and Agriculture for the Year Ending March 31, 1939.

Vol. 8 No. 3, July 1939.
The Yield of Sugar Cane in Barbados in 1939.
Report on Sugar Cane Breeding and Seedling Testing for the Year 1938—39, by A. E. S. McIntosh, B.Sc., Ph.D.

Vol. 8 No. 4, Oct. 1939.
Introduction, by R. W. E. Tucker, M.A., B.Ed., of Dry Area Race of *M. minense* into Barbados.
The Termites of Barbados, by R. W. E. Tucker, M.A., B.Ed.
Bufo Marinus, L. in Barbados, by R. W. E. Tucker, M.A., B.Ed.

Vol. 9 No. 1, Jan. 1940.
Manurial Trials with Sugar Cane, by C. B. Johnston, B.Sc.

Annual Report of the Department of Science and Agriculture for the year 1940—41.

Annual Report of the Department of Science and Agriculture for the year 1941—42. (Out of Print).

Annual Report of the Department of Science and Agriculture for the year 1942—43. (Out of Print).

Annual Report of the Department of Science and Agriculture for the year Ending 31st March, 1944.

Annual Report of the Department of Science and Agriculture for the Year 1944—45.

Annual Report of the Department of Science and Agriculture for the Year 1945—46.

Annual Report of the Department of Science and Agriculture for the Year 1946—47.

Annual Report of the Department of Science and Agriculture for the Year 1947—48. (Out of Print).

Annual Report of the Department of Science and Agriculture for the year 1948—49.

Annual Report of the Department of Science and Agriculture for the Year 1949—50.

Annual Report of the Department of Science and Agriculture for the Year 1950—51. (Out of Print).

Annual Report of the Department of Science and Agriculture for the Year 1951—52. (Out of Print).

Pamphlets (New Series):

No. 1, Jan. 1941	Garden Pests of Local Importance.
No. 2, Jan. 1941.	Manuring of Crops.
No. 3.	The Identification and Treatment of the Common Diseases of the Chief Vegetable Crops.
No. 4.	Compost Making.
No. 5. (Out of print).	Rabbit Keeping in Barbados.
No. 6, Aug.	The Care and Maintenance of the Milch Goat in Barbados.
No. 7.	The Growing of Food Crops.
No. 8 (Out of print).	Hints to Cotton Growers.
No. 9, Oct. 1942.	The Selection and Storage of Seed Corn in Barbados.
No. 10, Oct. 1942.	(1) Possible Means for an Efficient Use of a Large Sweet Potato Crop. (2) War-time Rations for Livestock. (3) The Storage of Sweet Potatoes in Clamps.
No. 11, Nov. 1942.	Ways of Cooking Sweet Potatoes.
No. 12 (Out of print)	Recipes for the Use of Local Foodstuffs.
No. 13.	Recipes for the Use of Cassava Flour.
No. 14, Nov. 1945.	The Use of D.D.T. in Barbados.

No. 15, Oct. 1947. Contour Farming.

No. 16, Dec. 1948. Contour Cultivation in Barbados.

No. 17, July 1949 (Out of print). Hints on the Growing of Citrus Trees.

No. 18, May 1950. Soil Conditions and Sugar Cane Growth in Barbados.

No. 19, July 1951. The Termites (Wood Ants) of Barbados.

Bulletins (New Series):

No. 1, Jan. 1944. Inventory of the Barbados Rocks and their Possible Utilization, by Alfred Senn, Ph.D.

No. 2, Aug. 1944 (Out of print). The Culture of Garden Vegetables in Barbados, by D. M. Hanschell, B.Sc.

No. 3. Notes on West Indian Hurricanes with Special Reference to Barbados, by C. C. Skeete, B.A.

No. 4, May 1945. Manurial Trials with Food Crops, by F. H. B. Blackburn, B.Sc., A.R.I.C.

No. 5, Oct. 1945. The Yield of Sugar Cane in Barbados in 1945, by C. B. Foster.

No. 6, Jan. 1946. Sugar Cane and its Cultivation in Barbados, by C. B. Foster.

No. 7, July 1946. Manurial Trials with Sugar Cane in Barbados, by F. H. B. Blackburn, B.Sc., A.R.I.C.

No. 8, July 1946. The Yield of Sugar Cane in Barbados in 1942, by C. B. Foster.

No. 9. The Yield of Sugar Cane in Barbados in 1946, by C. B. Foster.

No. 10, Aug. 1947. The Yield of Sugar Cane in Barbados in 1947, by C. B. Foster.

No. 11, Oct. 1947 (Out of print). Peasant Agriculture in Barbados, by M. Halcrow, B.Sc., A.I.C.T.A., and J. M. Cave, D.I.C.T.A.

No. 12, July 1948. The Yield of Sugar Cane in Barbados in 1948, by C. B. Foster.

No. 13, July 1949. The Yield of Sugar Cane in Barbados in 1949, by C. B. Foster.

No. 14, Dec. 1949. Manurial Trials with Sugar Cane in Barbados II, by J. B. D. Robinson, B.Sc.

No. 15, Aug. 1950. The Yield of Sugar Cane in Barbados in 1950, by C. B. Foster.

No. 16, Dec. 1950. Manurial Trials with Corn, by J. B. D. Robinson, B.Sc.

No. 17, Nov. 1951. Notes on Co-operation by J. M. Cave, D.I.C.T.A.

No. 17, Dec. 1951. The Yield of Sugar Cane in Barbados in 1951, by C. B. Foster.

No. 18, Jan. 1952. Manurial Trials with Sugar Cane in Barbados III, by J. B. D. Robinson, B.Sc.

No. 19, July 1952. The Yield of Sugar Cane in Barbados in 1952, by C. B. Foster.

British West Indies Central Sugar Cane Breeding Station.

Reports:

Report on the British West Indies Central Sugar Cane Breeding Station for the Period Ending September 30, 1934.

Report for the Year Ending September 30, 1935.

Third Annual Report Ending September 30, 1936.

Fourth Annual Report Ending September 30, 1937.

Fifth Annual Report Ending September 30, 1938.

Sixth Annual Report Ending September 30, 1939.

Seventh Annual Report Ending September 30, 1940.

Eighth Annual Report Ending September 30, 1941.

Ninth Annual Report Ending September 30, 1942.

Tenth Annual Report Ending September 30, 1943.

Eleventh Annual Report Ending September 30, 1944.

Twelfth Annual Report Ending September 30, 1945.

Thirteenth Annual Report Ending September 30, 1946.

Fourteenth Annual Report Ending September 30, 1947.

Fifteenth Annual Report Ending September 30, 1948.

Sixteenth Annual Report Ending September 30, 1949.

Seventeenth Annual Report Ending September 30, 1950.

Eighteenth Annual Report Ending September 30, 1951.

Nineteenth Annual Report Ending September 30, 1952.

Bulletins:

No. 1, Sept. 1933. Report on the Sugar Cane Breeding Problems of Antigua, Trinidad and St. Kitts, by A. E. S. McIntosh, B.Sc., Ph.D., Geneticist.

No. 2, June 1934.	Report on the Sugar Cane Variety Problems in St. Lucia derived from a Visit during April, 1934, by A. E. S. McIntosh, B.Sc., Ph.D., Geneticist.
No. 3, Sept. 1934.	Report on a Visit to Jamaica, June 1934, by A. E. S. McIntosh, B.Sc., Ph.D., Geneticist.
No. 4, Nov. 1934 (Out of print)	Report on a Visit to Grenada, by A. E. S. McIntish, B.Sc., Ph.D., Geneticist.
No. 5, Feb. 1935 (Out of print)	Investigations into the Root Development of the Sugar Cane in Barbados. (i) Root Development in several Varieties under one Environment, by G. C. Stevenson, B.A., A.I.C.T.A., Assistant Botanist, and A. E. S. McIntosh, BSc, PhD, Geneticist
No. 6, June 1935.	An Account of the Policy and Mehtods Employed in the Breeding and Initial Stage of selecting Sugar Cane Seedlings, by A. E. S. McIntosh, B.Sc., Ph.D., Geneticist.
No. 7, July 1935.	Report on a Second Visit to Antigua, April 1935, by A. E. S. McIntosh, B.Sc., Ph.D., Geneticist.
No. 8, Aug. 1935.	Gumming Disease Investigations in Barbados, by A. E. S. McIntosh, B.Sc., Ph.D., and G, C. Stevenson, B.A., A.I.C.T.A.
No. 9, Nov. 1935 (Out of print)	An Account of the Methods Employed in Testing and Selecting Sugar Cane Seedlings for Thick Cane Areas in the British West Indies, by A. E. S. McIntosh, B.Sc., Ph.D.
No. 10, Aug. 1936.	The Yield of Sugar Cane in Barbados in 1936.
No. 11, Nov. 1936.	Investigations into the Root Development of Sugar Cane in Barbados. (ii) Further Observations on Root Development in several Varieties under one Environment, By G. C. Stevenson, B.A., A.I.C.T.A.
No. 12, April 1937.	Sugar Cane Fuzz Storage Experiments.
No. 13, June 1937.	Report on a Second Visit to Grenada, April 1937, by A. E. S. McIntosh, B.Sc., Ph.D.
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No. 17, Aug. 1937 (Out of print)	The Yield of Sugar Cane in Barbados in 1937.
No. 81, June 1938.	Studies in the Use of the Zeiss Hand Refractometer. (ii) The Zeiss Hand Refractometer as an Indicator of Ripening in Sugar Cane, by A. E. S. McIntosh and G. C. Stevenson, B.A., A.I.C.T.A.
No. 19, Nov. 1938.	Report on a Second Visit to Jamaica, October 1938, by A E. S. McIntosh, B.Sc., Ph.D.

No. 20, Jan. 1939.	The Yield of Sugar Cane in Barbados in 1938.
No. 21, Sept. 1939.	The Yield of Sugar Cane in Barbados in 1939.
No. 22, Nov. 1940.	Report on a Third Visit to Jamaica, October 1940, by A. E. S. McIntosh, B.Sc., Ph.D.
No. 23, Sept. 1941.	The Yield of Sugar Cane in Barbados in 1940.
No. 24, July 1942 (Out of print)	The Yield of Sugar Cane in Barbados in 1941.
No. 25, Jan. 1944.	The Yield of Sugar Cane in Barbados in 1943.
No. 26, May 1944.	A. Report on a Fourth Visit to Jamaica, Jan.—Feb. 1944, by A. E. S. McIntosh, B.Sc., Ph.D. B. Sugar Cane Mosaic Disease in Jamaica and Barbados, by B. deL. Inniss, B.Sc., A.I.C.T.A. C. Report on a Visit to Trinidad, February 1944, by A. E. S. McIntosh, B.Sc., Ph.D.
No. 27, Nov. 1944.	Report on a Visit to British Guiana, July and August, 1944, by A. E. S. McIntosh, B.Sc., Ph.D.
No. 28, Oct. 1944 (Out of print)	The Yield of Sugar Cane in Barbados in 1944.
No. 29, Nov. 1947.	Report on a Visit to Jamaica, September—October 1947, by B. deL. Inniss, B.Sc., A.I.C.T.A.
No. 30, Dec. 1949 (Out of print)	Report on a Visit to The Dominican Republic, August 1949, by G. C. Stevenson, B.A., A.I.C.T.A.
No. 31, Jan. 1950 (Out of print)	Report on the Sugar Cane Variety Situation in Trinidad by G. C. Stevenson, B.A., A.I.C.T.A.
No. 32, June 1950 (Out of print)	Report on the Sugar Cane Variety Situation in Jamaica, April 1950, by G. C. Stevenson, B.A., A.I.C.T.A.
No. 33, Jan. 1951.	Report on a Visit to the Sugar Cane Research Institutes of the U.S.A., November 1950, by G. C. Stevenson, B.A., A.I.C.T.A.
No. 34, Feb. 1951.	Report on a Visit to British Guiana, January—February, 1950, by G. C. Stevenson, B.A., A.I.C.T.A.
No. 35, June 1951 (Out of print).	Report on a Visit to Guadeloupe, April 1951, by G. C. Stevenson, B.A., A.I.C.T.A.
No. 36, June 1951 (Out of print)	Report on a Visit to St. Lucia and Grenada, July, 1951, by G. C. Stevenson, B.A., A.I.C.T.A.

APPENDIX I.

METEOROLOGICAL OBSERVATIONS RECORDED AT THE METEOROLOGICAL STATION, CODRINGTON.

Height above Sea Level 181 feet

Latitude 13° 7′ 36″ N. Longitude 59° 35′ 57″ W.

The following are the summaries of the observations recorded for the year 1952. The details are given in Appendix II.

Barometric Pressure. The records refer to observations made at the hours of 9.00 a.m. and 3.00 p.m. only, and are expressed in inches of mercury. During the year 1952 the mean pressure corrected for temperature and gravity and reduced to sea level was at 9.00 a.m. 29.973 and at 3.00 p.m. 29.897, the highest pressure recorded being 30.063 on the 19th of March and the lowest 29.757 on the 19th of November. For the ten-year period 1942—51 the average barometric pressure was at 9.00 a.m. 29.976 and at 3.00 p.m. 29.903. The highest pressure recorded at 9.00 a.m. during the ten-year period was 30.131 on the 21st of February, 1946, and the lowest pressure recorded at 3.00 p.m. was 29.658 on the 12th of November, 1946.

Temperature. The daily mean maximum temperature for the year 1952 was 85.9°F. and the daily mean minimum 72.3°F. The maximum extreme for the year was 92.5°F. registered on the 24th and 26th of August; and the minimum extreme was 65.0°F. registered on the 9th March. The average monthly mean temperature was 79.1°F. the highest monthly range 23.5°F. and the lowest 17.5°F.; the mean monthly range being 20.0°F. For the ten-year period 1942—51 the daily mean maximum was 85.2°F. and the daily mean minimum 72.2°F. During the same ten-year period the average monthly mean temperature was 78.6°F.; the maximum extreme was 95.0°F. on the 21st of August, 1943; the minimum extreme 60.5°F. on the 29th February, 1944, and the 11th and 15th January, 1949; and the average monthly range 19.0°F.

Tension of Vapour and Relative Humidity. The mean tension of vapour for the year 1952 was at 8.00 a.m. .772 and at 4.00 p.m. .724. The mean relative humidity was at 8.00 a.m. 75.4 per cent. and at 4.00 p.m. 65.4 per cent.

Wind. The daily (24-hour period) mean velocity of the wind during the year 1952 was 7.6 miles an hour. Records were kept of half-daily or twelve-hour periods from 6.00 a.m. to 6.00 p.m. and 6.00 p.m. to 6.00 a.m. The maximum velocity for any such twelve-hour period was 18.5 miles an hour, recorded between 6.00 a.m. and 6.00 p.m. on the 5th of July and the minimum velocity 1.8 miles an hour recorded between 6.00 p.m. and 6.00 a.m on the 26th of August. The average daily (24-hour period) velocity for the ten-year period ended 1951 was 9.2 miles an hour.

Rainfall. The rainfall measured at the Government Meteorological Station during the year 1952 amounted to 41.10 inches. Rainfall was recorded on 183 days, the greatest fall being 3.15 inches on the 15th of October. For the ten-year period 1942—51 the average total rainfall was 53.24 inches, and the average number of days annually on which rain fell was 189.

Rainfall of the Island. The average total rainfall for the year 1952 from 69 stations was 51.57 inches, being 8.64 inches below the average for the hundred years ended December 31, 1951, which was 60.21 inches. Details are given in Appendix III.

APPENDIX II.

Meteorological Report for 1952

MONTH	Mean Pressure Reduced to 32°F Latitude 45° and Mean Sea Level					TEMPERATURE °F								TENSION OF VAPOUR			RELATIVE HUMIDITY			Velocity Miles per Hour	Daily Mean Sunshine (hours)	Rainfall (Inches)	No. of Days on which Rain fell
	9 a.m.	3 p.m.	Mean	Highest	Lowest	Max. Mean	Min. Mean	Max. Extreme	Min. Extreme	Mean for Month	Range for Month	Dew Point 8 a.m.	Dew Point 4 p.m.	8 a.m.	4 p.m.	Mean	8 a.m.	4 p.m.	Mean				
January ...	29.997	29.914	29.955	30.051	29.860	83.7	69.4	85.5	66.5	76.5	19.0	69.6	66.6	.725	.654	.689	79.3	62.4	70.8	6.7	9.3	0.43	9
February ...	29.991	29.909	29.950	30.028	29.845	85.0	69.8	87.5	66.0	77.4	21.5	67.5	64.7	.675	.612	.643	71.0	56.6	63.8	8.4	9.8	0.07	3
March ...	29.988	29.911	29.949	30.063	29.845	85.5	70.3	88.5	65.0	77.9	23.5	68.3	66.4	.693	.650	.671	70.5	59.5	65.0	8.8	8.8	2.34	13
April ...	29.980	29.903	29.942	30.030	29.867	86.2	72.1	87.5	69.0	79.1	18.5	70.2	68.4	.739	.696	.717	72.0	63.1	67.5	8.7	9.5	2.55	11
May ...	29.988	29.916	29.952	30.038	29.842	87.4	74.0	89.5	71.0	80.7	18.5	71.8	69.9	.780	.725	.752	71.7	62.1	66.9	7.8	8.4	2.17	16
June ...	30.002	29.941	29.972	30.037	29.888	86.3	74.4	88.5	70.5	80.3	18.0	71.7	70.7	.783	.752	.767	73.3	65.8	69.6	10.2	8.4	4.68	19
July ...	29.995	29.942	29.968	30.027	29.902	86.5	73.5	88.5	71.0	80.0	17.5	73.2	71.0	.819	.762	.790	78.1	67.9	73.0	8.0	8.8	4.01	23
August ...	29.967	29.905	29.936	30.016	29.841	88.5	73.8	92.5	70.0	81.1	22.5	73.0	70.7	.814	.752	.783	73.6	62.8	68.2	6.5	9.7	2.64	18
September ...	29.947	29.872	29.909	29.979	29.821	87.4	73.1	90.5	70.5	80.2	20.0	74.1	71.9	.843	.788	.815	78.6	69.1	73.8	5.0	7.2	5.30	14
October ...	29.953	29.862	29.907	30.019	29.807	86.6	73.2	90.0	69.5	79.9	20.5	73.5	72.5	.830	.800	.815	77.2	71.9	74.5	6.8	7.2	7.17	21
November ...	29.917	29.825	29.871	29.977	29.757	84.8	72.7	87.5	65.5	78.7	22.0	73.1	71.9	.816	.786	.801	81.5	73.4	77.4	5.8	7.4	6.25	21
December ...	29.952	29.866	29.909	30.048	29.805	82.9	71.5	84.5	66.5	77.2	18.0	70.4	69.2	.747	.719	.733	77.3	70.8	74.0	8.2	8.0	3.49	15
TOTAL ...	359.677	358.766	359.220	360.313	358.080	1030.8	867.8	1060.5	821.0	949.0	239.5	856 4	833.9	9.264	8.696	8.976	904.1	785.4	844.5	90.9	102.5	41.10	183
AVERAGE ...	29.973	29.897	29.935	30.026	29.840	85.9	72.3	88.4	68.4	79.1	20.0	71.4	69.5	.772	.724	.748	75.4	65.4	70.4	7.6	8.5	3.43	15

APPENDIX III.

Barbados Rainfall from January to December 1952.

Name of Station	Number of Stations	January		February		March		April		May		June		July		August		September		October		November		December		TOTAL.	
		Days	Inches	Days	Inches	Days	Inches	Days	Inches	Days	Inches	Days	Inches	Days	Inches	Days	Inches	Days	Inches	Days	Inches	Days	Inches	Days	Inches	Days	Inches
District "A"—St. Michael																											
Lowlands ...	6	4	.44	5	.35	9	2.50	9	2.44	14	3.04	15	4.76	18	4.26	15	2.89	14	5.47	20	7.31	19	7.28	9	3.39	151	44.13
District "B"—Christ Church																											
Lowlands ...	7	5	.45	5	.62	9	2.36	12	2.75	12	2.91	12	2.88	17	4.65	13	2.65	17	7.10	18	6.22	16	7.76	10	1.80	146	42.15
—St. George																											
Highlands ...	2	11	1.38	8	1.04	11	3.39	14	2.95	15	4.11	19	6.85	23	6.32	17	3.46	22	7.91	20	11.30	21	8.63	13	3.01	194	60.35
Lowlands ...	5	5	.65	4	.37	11	3.15	9	2.76	14	3.44	17	4.86	22	5.40	13	2.92	17	7.34	19	8.55	18	6.78	12	3.01	161	49.23
District "C"—St. Philip																											
Highlands ...	2	6	.58	8	.47	9	2.66	12	2.73	14	2.15	15	4.57	18	6.35	13	2.32	16	7.16	18	8.27	18	6.75	13	2.07	160	46.08
Lowlands ...	8	5	.40	5	.52	10	2.51	11	2.03	12	3.28	15	4.06	17	5.83	11	2.13	17	8.16	18	9.36	16	7.36	11	2.09	148	47.73
—St. John																											
Highlands ...	6	9	.91	11	.65	12	3.31	14	3.47	13	3.63	18	6.86	21	6.29	16	2.26	19	8.37	20	9.68	18	8.83	16	3.52	187	57.78
Lowlands ...	1	4	.35	2	.13	9	1.94	9	2.62	7	1.95	15	6.61	18	4.73	8	1.01	15	6.76	11	8.18	19	7.50	12	3.92	129	45.70
District "D"—St. Thomas																											
Highlands ...	5	9	.97	8	.72	12	3.58	15	4.11	14	3.64	20	6.27	21	6.38	18	5.39	19	8.20	22	11.56	19	10.09	15	4.64	192	65.55
Lowlands ...	2	8	.58	5	.48	12	3.02	11	4.07	9	2.87	17	7.31	18	6.66	14	5.19	17	7.48	19	10.30	18	9.93	14	3.78	162	61.67
—St James																											
Highlands ...	1	6	.95	5	.96	8	3.48	12	4.66	10	3.47	17	6.21	18	9.02	10	4.31	16	5.96	16	12.25	20	8.26	12	6.30	150	65.83
Lowlands ...	6	4	.39	4	.44	11	2.55	9	4.86	9	1.86	15	4.94	16	4.64	14	3.42	14	6.51	17	7.51	16	7.21	12	3.04	141	47.37
District "E"—St. Peter																											
Highlands ...	1	3	.62	4	.34	6	1.52	6	.54	8	3.24	9	5.06	14	4.41	11	5.37	13	7.18	10	7.39	14	4.96	7	3.62	105	44.25
Lowlands ...	5	6	.75	6	.82	8	2.68	9	1.76	10	3.47	14	5.68	16	5.72	16	3.67	17	8.41	16	10.34	16	6.72	12	4.76	146	54.78
—St. Lucy																											
Lowlands ...	3	4	.31	7	.58	10	2.53	9	1.86	10	2.21	15	4.79	15	4.28	13	5.37	15	7.64	12	8.76	16	5.12	7	3.56	133	47.01
District "F"—St. Joseph																											
Highlands ...	4	6	.34	10	.60	10	2.70	15	3.47	16	2.79	19	5.36	17	5.91	16	2.84	18	7.23	17	9.16	17	8.03	18	4.41	179	52.84
—St. Andrew																											
Highlands ...	2	5	.84	6	.59	7	2.18	9	2.33	10	3.68	15	4.88	16	5.89	15	3.69	16	6.60	17	9.17	18	7.39	11	3.99	145	51.23
Lowlands ...	3	6	.70	6	.77	7	1.45	7	1.68	10	2.96	13	4.93	14	5.32	11	3.49	15	6.34	13	7.89	13	6.07	9	2.99	124	44.59
Totals	69	106	11.61	109	10.45	171	47.51	192	51.09	207	54.70	280	96.88	319	102.06	244	62.38	297	129.82	303	163.20	312	134.67	213	63.60	2,753	928.27
Average		6	.65	6	.58	9	2.64	11	2.84	11	3.04	16	5.38	18	5.67	14	3.47	16	7.21	17	9.07	17	7.48	12	3.54	153	51.57